July 14, 2011

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Re: Response to Comments on the *Buildings 82 and 603 Data Summary and Risk-Based Screening Technical Memorandum,* UCC South Charleston Facility, South Charleston, West Virginia *(*submitted most recently on September 6, 2006*)*

Dear Mr. Wentworth:

This letter is in response to comments received from the U.S. Environmental Protection Agency (USEPA) regarding the above-referenced document for the Union Carbide Corporation (UCC) South Charleston Facility in South Charleston, West Virginia (Facility). UCC is a wholly owned subsidiary of The Dow Chemical Company. On September 6, 2006, UCC submitted the *Buildings 82 and 603 Data Summary and Risk-Based Screening Technical Memorandum* (technical memorandum) to USEPA. This memorandum was to support redevelopment of that portion of the Facility by divestiture to the University of Charleston. On December 2, 2009, USEPA provided comments on the technical memorandum. Since that submittal of the technical memorandum and USEPA's comments, the University of Charleston is looking to further divest this property. To support that effort, additional environmental data have been collected, and an updated screening-level human health risk assessment (HHRA) has been performed. This information has been compiled into a comprehensive HHRA report for the former Buildings 82 and 603 area, which supersedes the technical memorandum. Below are USEPA's December 2, 2009, comments on the 2006 technical memorandum, along with UCC's responses, which have been incorporated into the current report:

Comment 1: *Groundwater Results and Conclusions: The vapor intrusion discussion is weak. Please add the following:*

a) For carbon tetrachloride and benzene, please revise these sections to present risk ratios using the USEPA 2002 Vapor Intrusion Guidance groundwater to indoor air attenuation factor of 0.001 and the Regional Screening Table residential air RBCs [risk-based concentrations]. *The resulting approximate 2E-7 risk estimate shows that these groundwater chemicals will not pose an unacceptable risk to building occupants.*

b) For vinyl chloride, please revise to include that the location of the groundwater vinyl chloride detection is considered by USEPA as too far in distance from either building to pose a vapor intrusion threat

Response: The current report text was first revised to indicate that no structures currently exist at the site. Buildings 82 and 603 have been demolished since the most recent submission of the technical memorandum referenced above, and vapor intrusion is discussed in the screening-level HHRA with respect to potential future exposure scenarios only. Risk ratio results also were added to the report for both future residential and future commercial/industrial exposure scenarios. Text was added to state that an environmental covenant will be placed on the property requiring vapor barriers for any future buildings that are constructed on this area of the Facility. Groundwater monitoring also will be part of the environmental covenant.

In addition, after the technical memorandum was submitted to USEPA in September 2006, an increase in carbon tetrachloride concentrations was observed in a monitoring well that was located near the north side of former Building 82 (the well was destroyed during building demolition). UCC believes that carbon tetrachloride in groundwater near former Building 82 is not Facility-related. Text has been added to the report to update the recent groundwater concentrations and document the basis for why UCC does not attribute this to the Facility.

Comment 2: *Conclusions: Regarding groundwater, it is stated on p. 10: "However, this Site is surrounded by other industrial lands and groundwater under the site is not currently used, and will not be used as a drinking water supply in the future." Please revise to include what institutional controls or existing conditions (e.g., city ordinance) will prohibit groundwater use in the future.*

Response: Text has been added to state, "The site has a deed restriction to mitigate potential issues related to groundwater consumption, which states 'Groundwater from the property herein conveyed shall not be accessed or used at anytime for any purpose other than extraction of groundwater from installation, modification, operation, repair, or removal of monitoring and/or remediation wells, or in conjunction with construction activity where access to or contact with groundwater is unintended and/or incidental to and not otherwise for the purpose of using the groundwater.'" In addition, in 2004, the City of South Charleston incorporated a supplemental zoning requirement for the FMC facility and surrounding property, including the site, which prohibits the extraction of groundwater except for remediation purposes.

In addition to revising the current report text based on USEPA comments, CH2M HILL has updated the document based on the current status of former Buildings 82 and 603 (both have been demolished) and current information on groundwater conditions. CH2M HILL also has updated risk estimates associated with potential trespassers, future residents, and future industrial workers exposed to surface soil and a construction worker's potential future exposure to total soil, and presented the results in the updated report.

Screening-Level Human Health Risk Assessment for the Area of Former Buildings 82 and 603, South Charleston Facility, South Charleston, West Virginia

Prepared for

Union Carbide Corporation

A Wholly Owned Subsidiary of The Dow Chemical Company

July 2011

CH2MHILL

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Acronyms and Abbreviations

µg/L	micrograms per liter
BEHP	bis(2-ethylhexyl)phthalate
bgs	below ground surface
COPC	chemical of potential concern
DCE	dichloroethene
DQO	data quality objective
EI	Environmental Indicator
ELCR	excess lifetime cancer risk
EPC	exposure point concentration
Facility	Union Carbide Corporation South Charleston Facility, South Charleston, West Virginia
FMC	FMC Corporation
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
MCL	maximum contaminant level
mg/kg	milligram per kilogram
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
RCRA	Resource Conservation and Recovery Act
RSL	regional screening level
SIM	selected ion monitoring
Site	area of former Buildings 82 and 603
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TCE	trichloroethene

TM	technical memorandum
UCC	Union Carbide Corporation
UCL	upper confidence limit
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WVDEP	West Virginia Department of Environmental Protection

SECTION 1

Introduction

This report presents the results from the soil and groundwater sampling conducted in the area of former Buildings 82 and 603 (Site) at the Union Carbide Corporation (UCC) South Charleston Facility in South Charleston, West Virginia (Facility). UCC is a wholly owned subsidiary of The Dow Chemical Company. In addition, the report presents a screening-level human health risk assessment (HHRA) under one current land use condition (i.e., current trespasser) and three future land use conditions (i.e., future residential, future trespasser, and future commercial/industrial). This report supersedes the technical memorandum (TM) submitted to the U.S. Environmental Protection Agency (USEPA) in July 2006 and updated in September 2006 (CH2M HILL 2006). Since the original submittal, Buildings 82 and 603 have been demolished and a deed restriction has been put in place that limits redevelopment in some areas of the property to commercial and/or industrial use and prohibits the use of groundwater as potable water.

1.1 Site Description

The Facility occupies approximately 200 acres and has been in continuous operation for petroleum refining and chemical production since the early 1900s. UCC entered the USEPA Region 3 Facility Lead Program through an Agreement signed by USEPA and UCC effective December 15, 1999. The Site that is the subject of this report, the area of former Buildings 82 and 603, is grouped with the South Charleston Facility under the Agreement. However, it is physically distinct from the Facility and was used primarily as Facility office space. Historical environmental surveys conducted in the mid-1980s did not identify storage or handling of hazardous wastes at this location. A review of historical Sanborn maps indicated the Site was once occupied by a number of residential dwellings, a UCC machine shop (southwestern portion of the Site, approximately 100 feet south of former Building 82) (Civil & Environmental Consultants, Inc. 2006), and a synthetic, Dynel® fiber manufacturing facility located in the southeastern portion of the Site, approximately 100 feet south of former Building 603. No solid waste management units (SWMUs) have been identified in the vicinity of former Buildings 82 and 603.

The Site is on the southwest side of the Facility (Figure 1). The area is bounded by 5th Avenue and McCorkle Avenue (U.S. Route 60) on the north, 3rd Avenue on the south, B Street on the east, and C Street on the west (Figure 2).

The Site is flat with a parking lot and grass-covered areas, and is surrounded by other industrial lands, along with some commercial and residential use parcels. A Chevron service station is located immediately across B Street from the northeast portion of the former Building 603 area. A Speedway service station is directly across 4th Avenue from the northern extent of the former Building 603 area. Commercial businesses and two residential properties lie immediately across 3rd Avenue to the south (upgradient with respect to groundwater flow). Other industries formerly located in this vicinity include an

FMC Corporation (FMC) facility located northwest of former Building 82, and a laundromat and dry cleaning facility formerly located east of former Building 603.

A brief description of the Site geology and hydrogeology is presented below. Detailed discussions are presented in *The Dow South Charleston RCRA* [Resource Conservation and Recovery Act] *Facility Investigation Report* (CH2M HILL 2003), the *Follow-up RCRA Facility Investigation Report* (CH2M HILL 2005), and the *Current Conditions Report* (CH2M HILL 2010).

Unconsolidated material at the Site is divided into two horizons: current cover or fill and underlying alluvial, "native" soils. There are several types of cover material overlying different portions of the Site. Much of the Site is paved or covered with grass or other landscaping. Areas within Tract 3 and Tract 7 (Figure 2) consist of "clean" fill dirt at the surface. The surface fill material within Tract 3 was emplaced by the University of Charleston subsequent to the demolition of Building 82 in 2009. The surface material at Tract 7, soil from approximately 0 to 1 foot below ground surface (bgs), is clean fill obtained from a formerly undeveloped site located adjacent to Corridor G during construction of a church in 2003. Additionally, in some areas of Tract 7, construction debris underlies the clean fill. The construction debris consists of concrete, asphalt, and other material, approximately 1.5 to 2 feet thick, and is apparently related to demolition of former structures in the area. The fill material is underlain by fine-grained silty clay and silts to depths of approximately 20 feet bgs. The fine-grained soils are underlain by silty sand down to the bedrock surface at approximately 55 feet bgs.

Groundwater occurs in the silty sand beneath the Site at approximately 28 feet bgs. There is evidence of a possible limited, shallow (5 feet bgs), perched groundwater beneath the Site, as observed through groundwater levels measured in one soil boring (SCFM-C-06). Soil boring SCMF-C-06 is approximately 150 feet south of former Building 82 and 240 feet west of former Building 603. This is an anomaly not encountered elsewhere at the Site (CH2M HILL 2004). The potentiometric surface of the aquifer across the Site is relatively flat. Groundwater moves generally from the southwest across the western portion of the Mainland, flows northeast, and discharges to the Kanawha River.

1.2 Site Investigations

Soil and groundwater data evaluated in this report include historical and more recently collected data. The three historical investigations are summarized in the following documents:

- *Building 603 Geoprobe® Investigation* (KEMRON 2002)
- *The Dow South Charleston RCRA Facility Investigation Report* (CH2M HILL 2003)
- *South Charleston Facility - Mainland Buildings 82 and 603 Sampling Data Summary Technical Memorandum* (CH2M HILL 2004)

The Facility received a positive "Current Human Exposure Under Control" Environmental Indicator (EI) determination in 2005 (USEPA 2005).

Groundwater data have been collected since the original submittal of this report and are presented in the *Current Conditions Report* (CH2M HILL 2010). Groundwater monitoring

also was performed in February and October 2010 after submittal of the *Current Conditions Report* (CH2M HILL 2010).

Additional soil data representative of potential future surface exposure also were collected on September 23, 2010, to use in the screening-level HHRA. Twelve surface soil samples were collected within Tracts 1, 2, 4, 5, 6, and 7 (Figure 3) to allow for evaluation of a future residential exposure scenario for surface soil. Additional samples were not collected within Tract 3 because the deed restriction specifies this area may only be used for commercial/industrial redevelopment. Note that some of the 2010 surface soil samples were actually collected at depth, assuming redevelopment activities would result in the removal of any current covering or fill, thereby exposing future receptors to the native material underneath. The data quality objectives (DQOs) of the September 2010 surface soil sampling efforts are detailed in the work plan (Appendix A). The analytical data report provided by the laboratory and the data validation reports (one per analytical method) are provided in Appendix B.

Further surface and subsurface soil sampling was performed on May 6, 2011, with the objective of delineating concentrations of polynuclear aromatic hydrocarbons (PAHs) around September 2010 sample SS-03 (Figure 2). The analytical and data validation reports for this effort are also provided in Appendix B. Further details regarding the May 2011 sampling effort are provided in Section 1.2.1.1, below.

The following sections summarize the nature and extent of contamination detected in the area of former Buildings 82 and 603.

1.2.1 Soil Results

The soil analytical data used in the screening-level HHRA include results from 13 subsurface soil samples collected in 2002, 4 surface soil and 4 subsurface soil samples collected in 2004, and 12 soil samples representative of potential future surface exposure collected in September 2010. Sample locations are presented on Figure 3.

The available sampling and analysis data are considered spatially representative of conditions at the Site and have adequately characterized the nature and extent of contamination in soil in and around former Buildings 82 and 603 for the purposes of conducting the screening-level HHRA.

All soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and the eight RCRA metals. Nickel also was reported in the 2002 and 2004 samples. The 2010 soil samples also were analyzed for PAHs by selected ion monitoring (SIM) Method SW8270-SIM. The analytical results are presented in Tables 1, 2, and 3 for the 2002, 2004, and 2010 soil sampling efforts, respectively.

Sporadic and relatively low concentrations of VOCs were detected in soil in the area of former Buildings 82 and 603. SVOCs detected in soil were principally PAHs detected around former Building 603. The highest concentrations of PAHs were clustered in samples collected near the southeast corner of Tract 7 in locations SB-1, SS-02, and SS-03 (Figure 2).

Due to the relatively high concentrations of PAHs noted in the southeast portion of Tract 7, step-out samples were taken around SS-03 on May 6, 2011. PAH concentrations at SS-03

were greater than the next highest concentrations by an order of magnitude; therefore, the step-out samples were collected in an attempt to delineate a potential hot spot of PAHs around SS-03. Samples were collected at locations 5 feet and 10 feet from SS-03 in each of the four ordinal directions at a depth of 1.5 to 2.5 feet bgs, similar to sample SS-03. Surface samples of the clean fill were also collected from each step-out location and from SS-03, itself, at a depth interval of 0 to 1 feet bgs. The samples were analyzed for PAHs by Method SW8270C. Analytical results are presented in Table 4 and the analytical and data validation reports are included in Appendix B. Additional details regarding the sampling effort are provided in Appendix C.

The analytical data, in combination with the lithological information obtained from the soil cores, and the fact that there were no known Facility-related activities in this area that may have resulted in releases of PAHs to soil, indicate that the PAH concentrations in this area of the Site are related to the asphalt present in the construction debris underlying the Tract 7 clean fill soil, and overlying the native soil where the original data from SS-03 were obtained in September 2010. The PAHs in native soil can be explained by leaching from the overlying fill, carry-down in the core liner from the overlying fill, and/or mixing of the fill material in the native soil.

Because the factors discussed above indicate that the PAHs in soil are not attributable to a release from the Facility, this area is, therefore, not subject to RCRA Corrective Action. Thus, analytical data from SS-03 and PAH results from the adjacent delineation borings are not included in the risk assessment presented in the body of this report. However, because these data represent constituent concentrations present at the Site, a supplemental screening-level risk evaluation was performed in order to aid in future land re-use and related management decisions. This supplemental evaluation of future exposure scenarios is presented in Appendix C and includes May 2011 data collected from 1.5 to 2.5 feet bgs as well as the September 2010 results from SS-03. Note that the May 2011 samples collected from 0 to 1 foot bgs are representative of the clean fill material, rather than construction debris, and were included in this screening-level risk assessment for the current trespasser exposure scenario as detailed in Section 2.1.

The PAHs at SS-02 are also likely associated with the same construction debris. However, there is no direct evidence available to support this such as there is with location SS-03; therefore, the data collected at SS-02 were included in this screening-level risk assessment. Including SS-02 in this evaluation is considered conservative with respect to PAH concentrations potentially related to a Facility release.

1.2.2 Groundwater Results

The groundwater analytical data used for this report include groundwater samples collected from 3 permanent piezometers (PZ039, PZ040, and PZ041), 14 groundwater grab samples (SCFM-C-01-GW through SCFM-C-14-GW), and 2 groundwater monitoring wells (MW021 and MW028D). PZ039 was sampled in 2003, 2004, 2007, and October 2010; PZ040 was sampled in 2003 and October 2010; PZ041 was sampled in 2003 and February and October 2010; the 14 groundwater grab samples were collected in 2004; data from MW021 were collected in 2006, 2007, and 2008; and data from MW028D were collected in February and October 2010. Piezometers data are presented in Table 5, and groundwater well data are listed in Table 6. Sample locations are presented on Figure 4. The 2003 and

2004 samples were analyzed for VOCs, SVOCs, and total and dissolved metals. Samples from 2006 through 2008 were analyzed for VOCs and SVOCs, and samples from 2010 were analyzed for VOCs.

The available sampling and analysis data for groundwater are considered spatially representative of the Site and have adequately characterized the nature and extent of contamination in groundwater for purposes of evaluating the potential risk to human receptors, including the potential vapor intrusion pathway in and around former Buildings 82 and 603.

Carbon tetrachloride is present in groundwater beneath the Site. Results for carbon tetrachloride from the October 2010 sampling are as follows: 5.47 micrograms per liter (µg/L) in MW028D; 6 µg/L in PZ040; and 66.2 µg/L in PZ041. The monitoring well and groundwater grab sample locations are shown on Figure 4. Based on available soil analytical data, the source of the carbon tetrachloride in groundwater beneath the Site is not located at the Site. It also does not appear to be Facility-related. While carbon tetrachloride occurs in Facility groundwater just north of McCorkle Avenue, the carbon tetrachloride is comingled with the primary groundwater contaminants (1,2-dichloroethane and 1,2-dichloropropane) in this area of the Facility, which are several orders of magnitude higher in concentration than carbon tetrachloride. However, 1,2-dichloroethane and 1,2-dichloropropane are not present in groundwater beneath the Site. Because these contaminants have not migrated upgradient to the Site, carbon tetrachloride could not have migrated upgradient to the Site. Groundwater wells on the Site will continue to be monitored to assess groundwater contamination trends.

1.3 Conceptual Site Exposure Model

As discussed previously, the area of former Buildings 82 and 603 is on the southwest side of the Facility and portions of the Site are identified for possible residential reuse. Potential pathways by which individuals could be exposed to the constituents in each environmental medium in the area of former Buildings 82 and 603 are identified in Table 7 and discussed by medium in the subsequent sections.

1.3.1 Current Exposure

Under current land use conditions, construction or excavation activities are not taking place, but there is potential for trespasser activity in the area because the Site is not fenced. A trespasser receptor is considered potentially exposed to Site surface soils only, but even this exposure scenario is unlikely given that most areas of the Site are presently paved or covered by grass. Additionally, any exposures that were to occur would be to the clean fill material covering the Site. Moreover, under current land use conditions, there are no direct exposures to groundwater. Groundwater on the Site and in the vicinity is not used for potable water. Therefore, all exposure pathways under current land use are considered incomplete or potentially incomplete (trespasser exposure to surface soils). Surface soil data representative of current Site conditions include only the May 2011 samples collected at a depth from 0 to 1 foot bgs around sample location SS-03 and September 2010 sample SS-12, also collected from 0 to 1 foot bgs.

1.3.2 Future Exposure

Exposure pathways under various future land use scenarios may include construction workers, indoor or outdoor commercial/industrial workers, or residents. Each scenario is discussed in the subsections below by exposure media.

1.3.2.1 Surface Soil

Surface soil data representative of future exposure included in the quantitative risk evaluations include data from 11 of the 12 surface soil samples collected in September 2010 (SS-03 is evaluated in Appendix C) and the 4 surface soil samples collected from 0 to 2 feet bgs in 2004 (SCFM-C-01, SCFM-C-04, SCFM-C-05, and SCFM-C-07) (Figure 3).

Surface soil sample location SCFM-C-05 (Figure 3), located within Tract 3, which was identified for commercial/industrial redevelopment only, was excluded from the residential risk evaluation. However, sample location SCFM-C-05 was included in the evaluation of the future trespasser and commercial/industrial worker exposure scenarios.

Data collected during the May 2011 focused PAH soil sampling in Tract 7 were not included in the risk assessment presented in Section 3 of this report. Refer to Section 1.2.1 for a summary and to Appendix C for further details regarding this sampling event and the associated data evaluation.

1.3.2.2 Total Soil

Under future land use, excavation or construction activities may occur if redevelopment of the Site occurs, and there may be exposure to surface and subsurface soil (referred to as total soil in the screening-level HHRA) during these activities. The most likely receptors to be exposed to total soil during excavation activities are construction workers. Soil data used to evaluate the construction worker exposure include all 2002, 2004, and 2010 soil data, except that collected at SS-03 at 1.5 to 2.5 ft bgs because it is evaluated in Appendix C (Figure 3). Results from all depth intervals (0 to 8 feet bgs) were included in the quantitative risk evaluation to account for a construction worker's potential exposure to surface and subsurface soil that may be encountered during excavation activities.

1.3.2.3 Groundwater

Although no buildings are present at the Site, potential exposures from vapor intrusion from VOCs in groundwater were evaluated for future land use considerations. Off-Site structures were not evaluated for vapor intrusion because the off-Site carbon tetrachloride in groundwater does not appear to be Facility-related. Under current and future land use, groundwater will not be used for potable water, in accordance with deed restrictions for the Site. If excavation or construction activities take place, it is unlikely that construction workers will encounter groundwater because the average depth to groundwater at the Site is approximately 28 feet; therefore, this exposure pathway was not included in the screening-level HHRA.

SECTION 2

Identification of Constituents of Potential Concern

Simple summary statistics and screening-level comparisons are provided in Table 8 for the current surface soil exposure scenario. Tables 9 through 12 present screening-level comparisons for future exposures to surface soil, total soil, direct contact to groundwater, and the vapor intrusion pathways, respectively. Summary tables (Tables 8 through 12) present chemical data for detects only and contain parameters such as the range of detected concentrations, location of the maximum detected concentration, frequency of detection, range of detection limits, and screening levels.

The maximum detected constituent concentrations were compared to the following risk-based screening levels.

The screening levels used for chemicals in soil were:

- USEPA regional screening levels (RSLs) for residential soil, based on a $1x10^{-6}$ excess lifetime cancer risk (ELCR) level (for carcinogenic chemicals), or a noncancer hazard quotient (HQ) of 0.1 (for chemicals that produce noncancer effects) (USEPA 2011). Note that residential RSL values are not compared to total soil summary statistics because only the construction worker exposure pathway is considered complete for this medium.
- USEPA RSLs for a trespasser receptor, based upon the residential soil screening levels detailed above, and adjusted to an exposure frequency of 52 days per year. This exposure frequency is considered conservative for the Site because it considers Site-specific information, including informal Site observations that indicate trespassers may walk across the Site but do not engage in activities where soil exposure would occur on a regular basis. Note that chemicals of potential concern (COPCs) were identified for the trespasser scenario based on the residential RSLs in order to provide for a conservative identification of COPCs for the risk calculations. Trespasser screening levels were not used as comparison criteria for the total soil summary statistics because only the construction worker exposure pathway is considered complete for this medium.
- USEPA RSLs for industrial soil, based upon a $1x10^{-6}$ ELCR level (for carcinogenic chemicals), or a noncancer HQ of 0.1 (for chemicals that produce noncancer effects) (USEPA 2011). Industrial RSLs are presented in both the surface soil and total soil summary tables for comparison. Industrial soil RSLs are assumed to be adequately protective for various types of workers, including construction workers, at the Site.
- USEPA 2011 mean natural background for West Virginia, as published in the *West Virginia Voluntary Remediation and Redevelopment Act, Guidance Manual* (West Virginia Department of Environmental Protection [WVDEP] 2001).

The screening levels used for groundwater were:

- USEPA RSLs for tap water, based upon a $1x10^{-6}$ ELCR level (for carcinogenic chemicals), or a noncancer HQ of 0.1 (for chemicals that produce noncancer effects) (USEPA 2011).
- Safe Drinking Water Act maximum contaminant level (MCL). The MCL is based on best available treatment technologies in addition to human health risk considerations.
- Generic vapor intrusion screening levels based on USEPA RSLs for residential indoor air, an attenuation factor of 0.001, an ELCR of 1×10^{-5}, and a noncancer HQ of 0.1 (USEPA 2011).
- Generic vapor intrusion screening levels based on USEPA RSLs for industrial indoor air, an attenuation factor of 0.001, an ELCR of 1×10^{-5}, and a noncancer HQ of 0.1 (USEPA 2011).

An ELCR of $1x10^{-5}$ was selected for the vapor intrusion screening levels based on USEPA's draft vapor intrusion guidance (USEPA 2002), which provides screening levels for indoor air, soil gas, and groundwater based on a range of target risk levels (i.e., tables of screening levels are provided for 10^{-4}, 10^{-5}, and 10^{-6} target risk levels). According to the 2002 guidance document, USEPA generally recommends using the 10^{-5} values to make determinations about current human exposures with respect to vapor intrusion. This target risk level, in USEPA's view, serves as a generally reasonable screening mechanism for the vapor intrusion pathway. Additionally, it takes into account practical issues associated with the analytical difficulties in taking air measurements and the possible presence of many constituents of concern due to contributions from background sources, including ambient (outdoor) air and/or air emitted from indoor sources.

To provide a preliminary identification of potential risks to human health, COPCs were identified. Constituents were considered COPCs if they exceeded the medium-specific risk-based screening levels described above; COPCs for exposure to current and future surface soils were identified if the maximum detected concentration exceeded the associated residential soil screening level; total soil COPCs were identified if the maximum detected concentration exceeded the associated industrial soil screening level; and groundwater vapor intrusion COPCs were identified if the maximum detected concentration exceeded the generic vapor intrusion screening level for protection of residential indoor air. Although groundwater data were compared to direct contact screening levels based on ingestion and inhalation exposure pathways (Table 11), COPCs were not selected for direct contact (ingestion and inhalation exposure pathways) to groundwater because this pathway is considered incomplete.

2.1 Current Surface Soil Exposure Screening

The risk-based screening of constituents in surface soils considered for the current trespasser exposure scenario is provided in Table 8. September 2010 sample SS-12 was analyzed for VOCs, SVOCs, including PAHs, PCBs, and metals and the May 2011 samples from SS-03 and SS-13 through SS-16 were analyzed for PAHs only. Detected constituents in these samples include only metals and PAHs, and each are discussed in the subsections below.

2.1.1 Metals

Five metals (arsenic, barium, chromium, lead, and nickel) were detected in Site surface soils considered for current exposure scenarios. Of the detected metals, arsenic and chromium exceeded residential and trespasser screening levels, but were eliminated as COPCs because maximum concentrations were below background levels for West Virginia soil.

2.1.2 Semivolatile Organic Compounds

Twelve PAHs were detected in Site surface soils considered for current exposure scenarios, but only the maximum detected concentration of benzo(a)pyrene exceeded the residential soil RSL and was identified as a COPC.

2.2 Future Surface Soil Exposure Screening

The results of the risk-based screening of constituents in surface soils considered for future exposure scenarios are listed in Table 9. Although the surface soil sample locations selected to represent potential future residential exposure differ from those selected to represent current trespasser and potential future industrial worker exposure (residential exposure does not include location SCFM-C-05 in Tract 3), all future surface soil sample locations were included in the Table 9 summary statistics. No impact to the risk assessment is expected, however, because bis(2-ethylhexyl)phthalate (BEHP) was the only constituent detected at SCFM-C-05, and it was not selected as a COPC. The following paragraphs provide further discussion of those constituents selected as COPCs based on residential screening-level exceedances.

2.2.1 Metals

Seven metals (arsenic, barium, chromium, lead, mercury, nickel, and selenium) were detected in Site surface soils considered for future exposure scenarios. Of the detected metals, barium and mercury were selected as surface soil COPCs because maximum detected concentrations exceeded residential RSLs for direct contact with soil. Arsenic was not selected as a COPC because the maximum detected concentration (8.7 milligrams per kilogram [mg/kg]) is within the range of the mean natural background level in soil for West Virginia of 8.64 mg/kg (WVDEP 2001). Chromium and selenium were eliminated as COPCs because maximum concentrations were below background levels for West Virginia soil, and lead and nickel were eliminated as COPCs because maximum concentrations were below residential soil RSLs.

2.2.2 Semivolatile Organic Compounds

Fifteen SVOCs were detected in surface soils considered for future exposure scenarios in the area of former Buildings 82 and 603. The maximum detected concentrations of benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded residential soil RSLs and were identified as COPCs. The highest concentrations of these PAHs were found in the southeast corner of Tract 7 at surface soil sample location SS-02 (Table 3, Figure 3).

2.2.3 Polychlorinated Biphenyls

Aroclor-1260 was detected in 1 of 16 surface soil samples. The maximum detected concentration did not exceed the residential soil RSL; therefore, Aroclor-1260 was not identified as a COPC for future surface soil.

2.2.4 Volatile Organic Compounds

Benzene, naphthalene, tetrachloroethene (PCE), toluene, and vinyl chloride were detected in the surface soil. None was identified as a COPC because maximum detected concentrations did not exceed the residential soil RSLs.

2.3 Future Total Soil Exposure Screening

The results of the risk-based screening of constituents in total soil (surface and subsurface soil) are listed in Table 10. Because construction workers are considered the only potential future receptor exposed to total soil, COPCs were identified as those exceeding industrial soil RSLs. The following paragraphs provide further discussion of those constituents and the COPC selection process for the quantitative risk evaluation.

2.3.1 Metals

Eight metals were detected in total soil (arsenic, barium, cadmium, chromium, lead, mercury, nickel, and selenium). None, however, was identified as a COPC for total soil because maximum concentrations (with the exception of arsenic) generally were below background. Arsenic also was not selected as a COPC because the maximum detected concentration (8.7 mg/kg) is within the range of the mean natural background level in soil for West Virginia of 8.64 mg/kg (WVDEP 2001).

2.3.2 Semivolatile Organic Compounds

Nineteen SVOCs were detected in the total soil in the area of former Buildings 82 and 603. The maximum detected concentrations of benzo(a)pyrene, benzo(a)anthracene, and dibenzo(a,h)anthracene exceeded industrial soil RSLs and were identified as COPCs for total soil. As noted in surface soil, the highest concentrations of these PAHs were found in the southeast corner of Tract 7 at surface soil sample location SS-02 (Table 3, Figure 3).

2.3.3 Polychlorinated Biphenyls

Aroclor-1260 was detected in 3 of 32 total soil samples. The maximum detected concentration did not exceed the industrial soil RSL; therefore, Aroclor-1260 was not identified as a COPC for total soil.

2.3.4 Volatile Organic Compounds

Thirteen VOCs were detected in total soil, but no concentrations exceeded associated industrial soil RSLs. Therefore, no VOCs were identified as COPCs for total soil.

2.4 Future Groundwater Exposure Screening

The future residential and industrial worker direct contact (ingestion and inhalation exposure pathways) exposure to groundwater screening is presented in Table 11, and the screening of volatile constituents in groundwater for future exposure via the vapor intrusion pathway is listed in Table 12. The following paragraphs provide further discussion of those constituents detected above direct contact and generic vapor intrusion screening levels.

2.4.1 Metals

Arsenic was detected in 2 of 19 samples; concentrations in the two samples were higher than the tap water RSL, and the maximum detected concentration was higher than the MCL. Lead also was detected in 2 of 19 samples, and the maximum detected concentration was higher than the MCL (i.e., action level). There is no tap water RSL for lead.

2.4.2 Semivolatile Organic Compounds

BEHP and benzo(k)fluoranthene were detected in groundwater. The maximum detected BEHP concentration was higher than the tap water RSL and the MCL. BEHP was detected in 7 of 24 samples; concentrations in the seven samples were higher than both screening levels. BEHP is known to be a common laboratory constituent found in almost all laboratory equipment and reagents, which can lead to false positives or inflated concentration values in low-level environmental samples (Agency for Toxic Substances and Disease Registry 1993). The maximum detected benzo(k)fluoranthene concentration was higher than the tap water RSL, but was detected in only 1 of the 24 samples.

2.4.3 Volatile Organic Compounds

Benzene was detected in 2 of 26 samples, and the maximum detected concentration was higher than the tap water RSL and the MCL. Historical sampling of groundwater monitoring wells at the Speedway service station (located east of the monitoring well in which benzene was detected) has identified benzene, toluene, ethylbenzene, and xylene as well as several chlorinated organics, such as vinyl chloride, dichloroethene (DCE), trichloroethene (TCE), PCE, and chloroform. A former laundromat and dry cleaning facility was located adjacent to and in an approximate upgradient direction from the Speedway service station.

In 2003 and 2004, carbon tetrachloride was detected at concentrations higher than the tap water RSL and the MCL. Data collected between 2006 and 2010 show a general increasing trend in carbon tetrachloride concentrations, as discussed in Section 1.2. All concentrations from 2006 through 2010 also are higher than the tap water RSL (0.2 µg/L) and the MCL (5 µg/L). Carbon tetrachloride in groundwater beneath former Building 82 does not appear to be related to UCC activities.

The maximum detected chloroform concentrations from 2003 and 2004 were higher than the tap water RSL. Chloroform was detected in 3 of 26 samples; all three samples were higher than the screening level. Concentrations of chloroform reported in 2010 were lower than those reported in 2003 and 2004, but were still higher than the risk-based screening levels used in this evaluation. PCE and TCE were detected once in groundwater, in the 2007 sample from PZ-039. The maximum detected PCE concentration exceeded the tap water

RSL but not the MCL, and detected TCE concentrations were below screening levels. Vinyl chloride was detected in 1 of 26 samples near the location of the former laundromat east of former Building 603. Vinyl chloride in groundwater can occur from the degradation of PCE and TCE, both of which have been used as dry cleaning solvents. This Site is downgradient of the former laundromat.

2.4.4 Groundwater Screening Summary

Although several constituents in groundwater exceed RSLs or MCLs, this Site is surrounded by other industrial, commercial, and residential properties, and groundwater under the Site currently is not used as a drinking water supply and will not be used as such in the future. The Site has a deed restriction to mitigate potential issues related to groundwater consumption, which states:

> *Groundwater from the property herein conveyed shall not be accessed or used at anytime for any purpose other than extraction of groundwater from installation, modification, operation, repair or removal of monitoring and/or remediation wells, or in conjunction with construction activity where access to or contact with groundwater is unintended and/or incidental to and not otherwise for the purpose of using the groundwater.*

Therefore, the drinking water pathway under current conditions or reasonably anticipated future conditions is considered incomplete and is not evaluated further.

2.4.5 Vapor Intrusion

Potential indoor vapor intrusion pathways for potential future development were evaluated by comparing groundwater concentrations with screening levels based on USEPA RSLs for industrial air and residential air (USEPA 2011), Henry's Law, and a generic attenuation factor between VOCs in soil vapor at the groundwater table and indoor air of 0.001. As listed in Table 12, concentrations of carbon tetrachloride, chloroform, and vinyl chloride in groundwater were higher than the residential screening level for protection of indoor air and were identified as COPCs for the vapor intrusion pathway.

SECTION 3

Risk Characterization

Risk estimates were calculated using the assumption that default exposure assumptions for residents and commercial/industrial workers used in USEPA RSLs (USEPA 2011) are conservative for the types of activities that may occur within the area of former Buildings 82 and 603 and, therefore, are adequately health protective for potential future exposure scenarios. These assumptions include exposure frequencies of 350 days per year for residents and 250 days per year for workers, exposure durations of 30 years for residents and 25 years for workers, and the incidental ingestion, dermal contact, and inhalation exposure routes. The 52-day-per-year exposure frequency used in calculating trespasser screening levels also is assumed to be adequately protective for this receptor. Additionally, default exposure assumptions for commercial/industrial workers used in USEPA RSLs (USEPA 2011) were assumed to be adequately protective for evaluating the construction worker receptor. Incidental soil ingestion rates for an industrial worker are less than those for a construction worker; therefore, daily soil intake for a future construction worker may be underestimated. However, the exposure frequency (250 days per year) and exposure duration (25 years) assumed for an industrial worker are likely significant overestimations of a future construction worker's exposure time on-Site. Section 3.4 contains further discussion regarding uncertainties.

To obtain carcinogenic risk estimates for exposure to soil and groundwater via the vapor intrusion pathway, the sample concentration was divided by the associated RSL (based on medium and receptor, and the basis of the ELCR [$1x10^{-6}$ for soil and $1x10^{-5}$ for groundwater via the vapor intrusion pathway]). The resulting ratio then was multiplied by the ELCR basis (again, $1x10^{-6}$ for soil $1x10^{-5}$ for groundwater via the vapor intrusion pathway). HQs were calculated by dividing the sample concentration by the associated noncancer RSL, which was multiplied by 10 to essentially "un-adjust" the RSL to a target HQ of 1. Both the carcinogenic and noncancer risk estimates then were summed across all constituents to provide a cumulative lifetime cancer risk and noncancer hazard index (HI), respectively.

Sample-by-sample risk estimates evaluating potential current trespasser exposure to Site surface soils and potential future residential, trespasser, and industrial worker exposure to surface soils, and potential future construction worker exposure to total soils, were calculated for COPCs.[1] Sample-by-sample risks were evaluated to provide a spatial evaluation as detailed in the work plan (Appendix A). However, it is important to note that a sample-by–sample risk estimate is based on the assumption that all of a receptor's exposure occurs at the area of a single soil sample. While this is more appropriate for receptors such as future residents and construction workers who may be exposed to a limited area of the Site, these sample-specific risk estimates are likely overestimates of the overall average exposure that a receptor such as industrial worker would likely have at the Site. Therefore, in order to provide for a Site-wide exposure evaluation, a 95 percent upper confidence limit on the mean (UCL) and associated risks were also calculated for COPCs

[1] Not all COPCs were detected in all samples.

identified for a future industrial worker's exposure to surface soils. The UCLs were calculated using ProUCL version 4.1 and input and output workbooks are provided in Appendix D. UCLs and associated exposure point concentrations (EPCs), the lower of the UCL and the maximum detected concentration, for the future industrial worker exposure scenario are presented in Table 13. It should be noted, however, that the data used to calculate the UCL include the results from September 2010 sample location SS-03 at a depth of 1.5 to 2.5 feet bgs. As detailed in Appendix C and summarized in Section 1.2.1, this sample location is known to contain construction debris with PAH concentrations not related to a Facility release. As a result of including the SS-03 data in the UCL calculation, associated risk estimates are likely biased high with respect to soil constituent concentrations that are potentially Facility-related. Additionally, by including SS-03 in the EPC, Aroclor-1260 and chrysene were also included as COPCs. Concentrations of these two constituents exceeded associated residential RSLs at SS-03 only and were not identified as COPCs for future surface soil exposure scenarios in this screening-level risk assessment. Aroclor-1260 and chrysene, however, are included in the EPC risk estimates, likely lending to further overestimation.

Risk estimates for the current trespasser exposed to Site surface soils are presented in Table 14 and discussed in Section 3.1, below. Future residential risk estimate details are presented in Table 15 and summarized in Table 16. Future trespasser risk estimate details are presented in Table 17 and summarized in Table 18, while future industrial worker risk estimate details are presented in Table 19 and summarized in Table 20. Future construction worker risk estimate details are presented in Table 21 and summarized in Table 22. All future exposure scenario risk results are discussed in Section 3.2, below.

For VOCs in groundwater identified as COPCs for evaluation of the vapor intrusion pathway, risk estimates were calculated only for the maximum detected concentration of each constituent. Tables 23 and 24 present risk estimates associated with exposure to groundwater via the vapor intrusion pathway for residents and industrial workers, respectively results are discussed in Section 3.2.3.

3.1 Current Exposure

Only sample location SS-15 reported detected concentrations of the COPC benzo(a)pyrene; therefore, risk estimates are not presented for the other surface soil locations considered representative of current exposure. The carcinogenic risk estimate for the current trespasser scenario for benzo(a)pyrene at SS-15 is 3×10^{-7} (Table 14), below USEPA's risk management range of 1×10^{-6} to 1×10^{-4}. No noncancer HI estimate is presented because benzo(a)pyrene does not have associated, noncancer toxicity information.

3.2 Future Exposure

3.2.1 Surface Soil

3.2.1.1 Resident

Carcinogenic risk estimates for future residential exposure to surface soil range from 5×10^{-8} at SS-09 to 2×10^{-4} at SS-02 (Tables 15 and 16). Benzo(a)pyrene is the primary carcinogenic risk driver (contributing 64 to 78 percent of the cumulative risk) at all locations except SS-09 where benzo(b)fluoranthene contributes 56 percent of the cumulative risk. The residential

carcinogenic risk estimate for surface soil sample location SS-02 in Tract 7 is greater than USEPA's risk management range, but all other estimates were less than 1 x 10^{-4}. All noncancer HI estimates for the residential surface soil exposure scenario were below the threshold of 1.

3.2.1.2 Trespasser

Carcinogenic risk estimates for the future trespasser exposed to surface soil range from $8x10^{-9}$ at SS-09 to $3x10^{-5}$ at SS-02 (Tables 17 and 18) and are within USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$. Benzo(a)pyrene is the primary carcinogenic risk driver (contributing 64 to 78 percent of the cumulative risk) at all locations except SS-09, where benzo(b)fluoranthene contributes 56 percent of the cumulative risk. All noncancer HI estimates for the trespasser surface soil exposure scenario were below the threshold of 1.

3.2.1.3 Industrial Worker

Carcinogenic risk estimates for industrial exposure to surface soil range from $4x10^{-9}$ at SS-09 to $1x10^{-5}$ at SS-02 (Tables 19 and 20) and are within USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$. Benzo(a)pyrene is the primary carcinogenic risk driver (contributing 57 to 78 percent of the cumulative risk) at all locations except SS-09, where benzo(b)fluoranthene contributes 56 percent of the cumulative risk. The carcinogenic risk estimate associated with the Site-wide EPC values was $2x10^{-5}$. As noted, the data used to calculate the UCL include the results from September 2010 sample location SS-03 at a depth of 1.5 to 2.5 feet bgs, an area which contains construction debris with PAH concentrations not related to a Facility release; therefore, the risks associated with the Site-wide EPC concentration are greater than sample-by-sample risk estimates for the other surface samples. As a result of including the SS-03 data in the UCL calculation, risk estimates associated with the Site-wide EPC are likely biased high with respect to soil constituent concentrations that are potentially Facility-related. All noncancer HI estimates for the industrial surface soil exposure scenario were below the threshold of 1.

3.2.2 Total Soil

The cumulative carcinogenic risk estimates for COPCs for the construction worker range from $2x10^{-9}$ at SS-09 to $1x10^{-5}$ at SB-01 and SS-02 (Tables 21 and 22) and are within USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$. Benzo(a)pyrene is the primary contributor (contributing 63 to 91 percent of the cumulative risk) at all locations except SS-09, where benzo(a)anthracene contributes 100 percent of the cumulative risk. No associated noncancer HI was calculated for the construction worker exposure scenario because total soil COPCs do not have associated noncancer toxicity information.

3.2.3 Groundwater – via the Vapor Intrusion Pathway

3.2.3.1 Resident

The carcinogenic risk estimate for residential exposure to groundwater via the vapor intrusion pathway was $4x10^{-4}$ (Table 23), which exceeds USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$. Risk estimates indicate that institutional controls and/or mitigation techniques may be required for future residential structures to reduce exposure to volatile constituents in groundwater. The noncancer HI for the residential vapor intrusion exposure pathway was equal to the threshold of 1. Carbon tetrachloride (58 percent) and vinyl chloride (34 percent) are the primary contributors to the carcinogenic risk estimate, and

carbon tetrachloride is the primary contributor to the noncancer HI (79 percent). As noted previously, however, the presence of carbon tetrachloride in Site groundwater is not believed to be related to Facility activities.

3.2.3.2 Industrial Worker

The carcinogenic risk estimate for industrial worker exposure to groundwater via the vapor intrusion pathway was $6x10^{-5}$ (Table 24), which is within USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$. The noncancer HI for the residential vapor intrusion exposure pathway was less than the threshold of 1. Carbon tetrachloride (73 percent) is the primary contributor to the carcinogenic risk estimate. However, as noted previously, the presence of carbon tetrachloride in Site groundwater is not believed to be related to Facility activities.

3.3 Uncertainties

A number of uncertainties are inherent in the estimates of potential cumulative cancer risks presented in this screening-level HHRA. The key uncertainties for this HHRA are related to the exposure assumptions and models that make up the risk assessment process and include:

- Uses of industrial worker screening levels to estimate potential health risks to future construction workers may overestimate or underestimate risk. As previously noted, construction worker intake rates may be underestimated by industrial worker parameters, but the exposure duration of the industrial worker likely is a significant overestimation of that for the construction worker.

- Key uncertainties also related to this evaluation include those associated with the exposure to groundwater via the vapor intrusion pathway risk estimates. The generic risk-based screening levels for protection of indoor air on which the risks are based, as stated, are generic. Site-specific groundwater-to-indoor air attenuation may be overestimated or underestimated by the default assumption (0.001), thereby overestimating or underestimating risk.

- Under current land use conditions, exposure to constituents in surface soil at the Site is unlikely because areas of the Site are presently paved or covered by grass. There is potential for trespasser activity in the area because the Site is not fenced, but actual exposure to soil is limited by the pavement and grass covering the soil. Therefore, soil intake factors used in the risk assessment that are based on the assumption that soil is readily accessible for contact are likely to be overestimates of actual exposure.

- An exposure frequency of 52 days per year (1 day per week) and exposure duration of 30 years was assumed for the trespasser scenario in the risk assessment. Informal observations of Site use indicate people may walk across the Site but there have not been observations of people regularly participating in activities where soil exposure would occur. Therefore, the exposure frequency assumption used in the risk assessment is likely to be an overestimate of actual use of the Site by trespassers and, consequently, the risk results are most likely overestimated.

- Surface soil samples were collected in September 2010 to evaluate a potential future residential scenario at the Site. For this sampling event, "surface soil" was defined

as soil within the first foot of native soil under any current covering or gravel-type fill based on the assumption that these cover/gravel materials would be removed if future residential structures were constructed. Consequently, some of these surface soil samples were collected at depths greater than 1 to 2 feet bgs. However, as noted above, the surface soil sample results used in the risk assessment do not necessarily represent current surface soil conditions.

- Although sample-specific potential risk estimates were provided in the risk assessment for the trespasser exposure scenarios, it is unlikely that a trespasser would be consistently exposed to only one location on the Site each week (52 days) for 30 years. Therefore, sample-specific risk estimates are likely overestimates for actual exposure.
- Constituent concentrations at SS-02 are likely associated with the same construction debris noted at SS-03. However, there is no direct evidence available to support this such as there is with location SS-03; therefore, the data collected at SS-02 were included in this screening-level risk assessment. Including SS-02 in this evaluation is considered conservative with respect to PAH concentrations potentially related to a Facility release.

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SECTION 4

Conclusions

A screening-level HHRA was performed using analytical results from environmental sampling conducted around the area of former Buildings 82 and 603 at the UCC South Charleston Facility in West Virginia. Other land uses around the area of former Buildings 82 and 603 that may affect environmental sampling results include gas stations, a former laundromat and dry cleaner, and a former chemical manufacturing facility.

Available data are considered adequate for characterizing the nature and extent of contamination in surface and subsurface soil at the Site, and for characterizing the nature and extent of contamination in groundwater for purposes of evaluating the Site's potential vapor intrusion pathways. Surface soil exposure scenarios were evaluated for current trespassers and potential future resident, trespasser, and commercial/industrial worker scenarios. Total soil (including surface and subsurface soil samples) was evaluated for the potential future construction worker receptor exposed during excavation activities. Risk estimates for direct exposure to groundwater were not included in this screening-level HHRA because a deed restriction was put in place that restricts the use of groundwater as potable water. Exposure to groundwater via the vapor intrusion pathway, however, was evaluated for potential future residents and commercial/industrial workers exposed to indoor air.

4.1 Residential Land Use

Potential future residents at the Site were evaluated for exposure to surface soil and groundwater via the vapor intrusion pathway. A deed restriction was put in place limiting redevelopment within the area surrounding former Building 82 (Tract 3) to commercial and/or industrial use only. As a result, surface soil sample SCFM-C-05, collected within Tract 3 (Figure 3), was not included in the evaluation of the potential future residential exposure scenario.

Constituents detected in Site surface soils representative of potential future exposure scenarios at concentrations higher than residential screening levels include several metals, VOCs, PAHs, and Aroclor-1260. Risk estimates for potential future exposure to surface soil by residents generally were within USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$, and HIs were less than 1, indicating unrestricted reuse is appropriate for most of the property. The surface soil risk estimate was greater than $1x10^{-4}$ for sample SS-02, located in the southeast corner of Tract 7, for the future residential land use scenario. Potential risk management options for this area include:

- Restricting the use of Tract 7 to commercial/industrial reuse only. This option would be protective of human health because the risk estimates for soil exposure by workers were less than $1x10^{-4}$ ($1x10^{-5}$ at SS-02; $2x10^{-5}$ for the Site-wide UCL).
- Maintaining a cover or excavating the area would eliminate exposure pathways for soil to permit residential use.

Concentrations of carbon tetrachloride, chloroform, and vinyl chloride in groundwater beneath the Site also were detected above residential screening levels for evaluation of the vapor intrusion pathway. The buildings formerly present at the Site have been demolished, so there is no current on-Site vapor intrusion pathway. If the Site were to be redeveloped in the future, the vapor intrusion pathway would be potentially complete. Buildings beyond the Site were not evaluated for vapor intrusion because the source of the carbon tetrachloride in groundwater does not appear to be associated with the Site. Because VOCs are present in groundwater above screening levels and risk estimates ($4x10^{-4}$) are above USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$, an Environmental Covenant is recommended for the entire Site requiring vapor barriers for future buildings. Additionally, groundwater will continue to be monitored to assess VOC concentrations at the Site.

In summary, the results of the future residential land use evaluation indicate that potential exposure pathways at the Site are not complete under current conditions. If the Site were to be redeveloped, residential exposure to soil and groundwater via the vapor intrusion pathway would be potentially complete, and the screening-level HHRA indicates potential risks for these pathways are above USEPA's risk management range at some locations. Among the options for risk management for eliminating future residential exposure to surface soil are land use restrictions, maintaining a cover, or excavating the areas with soil PAH concentrations that result in risk estimates greater than USEPA's risk management range. Vapor barriers on future structures are an example of an engineering control to mitigate the potential risks related to vapor intrusion.

4.2 Trespasser Activities

Both current and future trespasser exposure scenarios were evaluated in this screening-level risk assessment. Current risk estimates were calculated based on data representative of current surface soil concentrations, and exposure for the future trespasser was evaluated based on surface soil samples representative of a future land reuse scenario where construction activities were assumed to result in the removal of any current covering or gravel-type fill, thereby exposing future receptors to the native material underneath.

Risk estimates for the current trespasser exposure scenario are less than 1×10^{-6} and risk estimates for the future trespasser scenario are within USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$. All noncancer HI estimates for the trespasser surface soil exposure scenario were below the threshold of 1.

4.3 Commercial/Industrial Land Use

Potential future commercial/industrial workers at the Site were evaluated for exposure to surface soil and groundwater via the vapor intrusion pathway. Those constituents detected in Site surface soil at concentrations higher than residential screening levels also were included in the commercial/industrial worker risk evaluation. Risk estimates for potential exposure to surface soil by commercial/industrial workers were all less than or equal to $1x10^{-4}$.

Carbon tetrachloride, chloroform, and vinyl chloride in groundwater were detected at concentrations above screening levels for evaluation of the vapor intrusion pathway in potential future commercial/industrial structures. Because VOCs are present in

groundwater above industrial screening levels, the associated vapor intrusion risk estimate ($6x10^{-5}$) is within USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$, and carbon tetrachloride concentrations in Site groundwater are potentially increasing (Section 1.2.2), an Environmental Covenant is recommended for the entire Site requiring vapor barriers for all future buildings. Additionally, groundwater will continue to be monitored to assess VOC concentrations at the Site.

4.4 Construction Activities

Exposure to subsurface soil by construction workers is a potentially complete exposure pathway if future excavation or construction activities were to occur. The screening-level HHRA indicates construction worker risks from exposure to soil are within USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$. A noncancer HI was not calculated for the construction worker exposure scenario because COPCs identified in total soil do not have associated noncancer toxicity information.

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SECTION 5

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Tables

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TABLE 1
Analytical Results for 2002 Soil Samples - Building 603 Area
Union Carbide Corporation
South Charleston, West Virginia

Sample ID	SB-1	SB-2	SB-3	SB-4	SB-5	SB-15 (FD)	SB-6	SB-7	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13
Sample Date	05/06/02	05/06/02	05/06/02	05/07/02	05/07/02	05/07/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02
Sample Depth (ft)	2 - 4	4.5 - 6.5	2 - 4	6 - 8	5.5 - 7.5	5.5 - 7.5	2 - 4	2 - 4	2 - 4	2 - 4	2 - 4	6 - 7	2 - 4	2 - 4
Chemical Name														
Volatile Organic Compounds (µg/kg)														
Acetone	120 U	130 U	9.2 J	43.2 J	120.0 U	130 U	7.13 J	22.4 J	120.0 U	120.0 U	120 U	8.69 J	120 U	20.2 J
Benzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Bromobenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Bromochloromethane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Bromodichloromethane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Bromoform	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Bromomethane	12 U	13 U	12.0 U	13 U	12 U	13 U	12.0 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1-Butanol	60.0 U	64 U	61.0 U	62 U	62 U	63 U	61.0 U	59 U	60 U	59 U	61 U	62 U	60 U	61 U
2-Butanone	120 U	130 U	120.0 U	130 U	120.0 U	130 U	120.0 U	7.60 J	120 U	120 U	120 U	5.79 J	120 U	120 U
n-Butylbenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
sec-Butylbenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
tert-Butylbenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Carbon Disulfide	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	1.65 J	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Carbon tetrachloride	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Chlorobenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Chlorodibromomethane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Chloroethane	12.0 U	13 U	12.0 U	13 U	12 U	13 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
2-Chloroethyl vinyl ether	12 U	13 U	12.0 U	13 U	12 U	13 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Chloroform	6.0 U	6.4 U	6.1 U	6.5 U	3.39 J	4.00 J	6.1 U	5.9 U	6 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Chloromethane	12 U	13 U	12 U	13 U	12 U	13 U	12.0 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
2-Chlorotoluene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
4-Chlorotoluene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Cyclohexanone	60 U	64 U	61 U	65 U	62 U	63 U	61 U	59 U	60 U	59 U	61 U	62 U	61 U	61 U
1,2-Dibromo-3-chloropropane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,2-Dibromoethane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Dibromomethane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,2-Dichlorobenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,3-Dichlorobenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,4-Dichlorobenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Dichlorodifluoromethane	12.0 U	13 U	12 U	13 U	12 U	13 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,1-Dichloroethane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,2-Dichloroethane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,1-Dichloroethene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
cis-1,2-Dichloroethene	6.0 U	6.4 U	6.1 U	6.5 U	9.91	10.0	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
trans-1,2-Dichloroethene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,2-Dichloropropane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,3-Dichloropropane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
2,2-Dichloropropane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
cis-1,3-Dichloropropene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
trans-1,3-Dichloropropene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,1-Dichloropropene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Ethyl acetate	60 U	64 U	61 U	65 U	62 U	63 U	61 U	71.8	60 U	59 U	61 U	62 U	61 U	61 U
Ethylbenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Ethyl ether	60 U	64 U	61 U	65 U	62 U	63 U	61 U	59 U	60 U	59 U	61 U	62 U	61 U	61 U
2-Hexanone	12 U	13 U	12 U	13 U	12 U	13 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Hexacholorobutadiene	6.0 U	6.4 U	6.1 U	6.5 U	1.65 J	6.3 U	6.1 U	5.9 U	6 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U

TABLE 1
Analytical Results for 2002 Soil Samples - Building 603 Area
Union Carbide Corporation
South Charleston, West Virginia

Sample ID	SB-1	SB-2	SB-3	SB-4	SB-5	SB-15 (FD)	SB-6	SB-7	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13
Sample Date	05/06/02	05/06/02	05/06/02	05/07/02	05/07/02	05/07/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02
Sample Depth (ft)	2 - 4	4.5 - 6.5	2 - 4	6 - 8	5.5 - 7.5	5.5 - 7.5	2 - 4	2 - 4	2 - 4	2 - 4	2 - 4	6 - 7	2 - 4	2 - 4
Chemical Name														
Isobutanol	120 U	130 U	120 U	130 U	120 U	130 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U
Isopropylbenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
p-Isopropyltoluene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
4-Methyl1-2-pentanone	12.0 U	13 U	12 U	13 U	12 U	13 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Methylene chloride	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
2-Nitropropane	60 U	64 U	61 U	65 U	62 U	63 U	61 U	59 U	60 U	59 U	61 U	62 U	61 U	61 U
Naphthalene	12 U	13 U	12 U	13 U	12 U	13 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
n-Propylbenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Styrene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,1,1,2-Tetrachloroethane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,1,2,2-Tetrachloroethane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Tetrachloroethene	6.0 U	6.4 U	6.1 U	6.5 U	245	190 D	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Toluene	0.872 J	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	1.41 J	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,2,3-Trichlorobenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,2,4-Trichlorobenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,1,1-Trichloroethane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,1,2-Trichloroethane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Trichloroethene	6.0 U	6.4 U	6.1 U	6.5 U	9.56	11.6	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Trichlorofluoromethane	12 U	13 U	12 U	13 U	12 U	13 U	12 U	12 U	12 U	12 U	12 U	12 U	6.1 U	12 U
1,2,3-Trichloropropane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,2,2-Trichlorotrifluoroethane	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	12 U	6.1 U
1,2,4-Trimethylbenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
1,3,5-Trimethylbenzene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Vinyl Acetate	12 U	13 U	12.0 U	13.0 U	12.0 U	13 U	12 U	12 U	12 U	12 U	12 U	12 U	12.0 U	12 U
Vinyl chloride	12 U	13 U	12.0 U	13.0 U	12.0 U	13 U	12 U	12 U	12 U	12 U	12 U	12 U	12.0 U	12 U
o-Xylene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
m-,p-Xylene	6.0 U	6.4 U	6.1 U	6.5 U	6.2 U	6.3 U	6.1 U	5.9 U	6.0 U	5.9 U	6.1 U	6.2 U	6.1 U	6.1 U
Semivolatile Organic Compounds (µg/kg)														
2-Methylphenol	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
3 & 4 Methylphenol	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Nitrobenzene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Pyridine	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
2-Ethoxyethanol	200 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	200 U	200 U	1,000 U	200 U	1,000 U
Phenol	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Bis (2-chloroethyl) ether	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
2-Chlorophenol	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
1,3-Dichlorobenzene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
1,4-Dichlorobenzene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Benzyl Alcohol	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
1,2-Dichlorobenzene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
2-Methylphenol	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
3 & 4 Methylphenol	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Bis (2-chloroisopropyl) ether	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
N-Nitrosodiphenylamine	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Hexachloroethane	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Nitrobenzene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Isophorone	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U

TABLE 1
Analytical Results for 2002 Soil Samples - Building 603 Area
Union Carbide Corporation
South Charleston, West Virginia

Sample ID	SB-1	SB-2	SB-3	SB-4	SB-5	SB-15 (FD)	SB-6	SB-7	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13
Sample Date	05/06/02	05/06/02	05/06/02	05/07/02	05/07/02	05/07/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02
Sample Depth (ft)	2 - 4	4.5 - 6.5	2 - 4	6 - 8	5.5 - 7.5	5.5 - 7.5	2 - 4	2 - 4	2 - 4	2 - 4	2 - 4	6 - 7	2 - 4	2 - 4
Chemical Name														
2-Nitrophenol	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
2,4-Dimethylphenol	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Benzoic Acid	5,000 U	1,100 U	1,000 U	1,100 U	1,000 U	1,000 U	1,000 U	980 U	990 U	970 U	1,000 U	5,100 U	1,000 U	5,000 U
Bis (2-chloroethoxy) methane	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
2,4-Dichlorophenol	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
1,2,4-Trichlorobenzene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Naphthalene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
4-Chloroaniline	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Hexachlorobutadiene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
4-Chloro-3-methylphenol	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
2-Methylnaphthalene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Hexachlorocyclopentadiene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
2,4,6-Trichlorophenol	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
2,4,5-Trichlorophenol	5,000 U	1,100 U	1,000 U	1,100 U	1,000 U	1,000 U	1,000 U	980 U	990 U	970 U	1,000 U	5,100 U	1,000 U	5,000 U
2-Chloronaphthalene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
2-Nitroaniline	5,000 U	1,100 U	1,000 U	1,100 U	1,000 U	1,000 U	1,000 U	980 U	990 U	970 U	1,000 U	5,100 U	1,000 U	5,000 U
Dimethyl phthalate	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Acenaphthylene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
2,6-Dinitrotoluene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
3-Nitroaniline	5,000 U	1,100 U	1,000 U	1,100 U	1,000 U	1,000 U	1,000 U	980 U	990 U	970 U	1,000 U	5,100 U	1,000 U	5,000 U
Acenaphthene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
2,4-Dinitrophenol	5,000 U	1,100 U	1,000 U	1,100 U	1,000 U	1,000 U	1,000 U	980 U	990 U	970 U	1,000 U	5,100 U	1,000 U	5,000 U
4-Nitrophenol	5,000 U	1,100 U	1,000 U	1,100 U	1,000 U	1,000 U	1,000 U	980 U	990 U	970 U	1,000 U	5,100 U	1,000 U	5,000 U
Dibenzofuran	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
2,4-Dinitrotoluene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Diethyl phthalate	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
4-Chlorophenyl phenyl ether	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Fluorene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
4-Nitroaniline	5,000 U	1,100 U	1,000 U	1,100 U	1,000 U	1,000 U	1,000 U	980 U	990 U	970 U	1,000 U	5,100 U	1,000 U	5,000 U
4,6-Dinitro-2-methylphenol	5,000 U	1,100 U	1,000 U	1,100 U	1,000 U	1,000 U	1,000 U	980 U	990 U	970 U	1,000 U	5,100 U	1,000 U	5,000 U
N-Nitrosodiphenylamine	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
4-Bromophenyl phenyl ether	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Hexachlorobenzene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Pentachlorophenol	5,000 U	1,100 U	1,000 U	1,100 U	1,000 U	1,000 U	1,000 U	980 U	990 U	970 U	1,000 U	5,100 U	1,000 U	5,000 U
Phenanthrene	4,420	210 U	200 U	220 U	539	232	204	186 J	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Anthracene	901 J	210 U	200 U	220 U	129 J	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Di-n-butylphthalate	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Fluoranthene	6,820	210 U	200 U	220 U	838	454	619	409	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Pyrene	5,910	210 U	200 U	220 U	733	406	615	377	200 U	190 U	200 U	1,000 U	200 U	1,410
Butyl benzylphthalate	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
3,3'-Dichlorobenzidine	2,000 U	420 U	400 U	430 U	410 U	420 U	410 U	390 U	400 U	390 U	400 U	2,000 U	400 U	2,000 U
Benzo (a) anthracene	3,060	210 U	200 U	220 U	383	216	339	214	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Chrysene	3,080	210 U	200 U	220 U	372	225	336	207	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Bis (2-ethylhexyl) phthalate	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	14,800
Di-n-octylphthalate	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Benzo (b) fluoranthene	3,570	210 U	200 U	220 U	416	253	408	212	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Benzo(k)fluoranthene	2,190	210 U	200 U	220 U	262	161 J	280	151 J	200 U	190 U	200 U	1,000 U	200 U	1,000 U

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Union Carbide Corporation
South Charleston, West Virginia

Sample ID	SB-1	SB-2	SB-3	SB-4	SB-5	SB-15 (FD)	SB-6	SB-7	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13
Sample Date	05/06/02	05/06/02	05/06/02	05/07/02	05/07/02	05/07/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02	05/06/02
Sample Depth (ft)	2 - 4	4.5 - 6.5	2 - 4	6 - 8	5.5 - 7.5	5.5 - 7.5	2 - 4	2 - 4	2 - 4	2 - 4	2 - 4	6 - 7	2 - 4	2 - 4
Chemical Name														
Benzo (a) pyrene	2,810	210 U	200 U	220 U	348	210	337	187 J	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Indeno (1,2,3-c,d) pyrene	1,280	210 U	200 U	220 U	157 J	210 U	144 J	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Dibenzo (a,h) anthracene	1,000 U	210 U	200 U	220 U	210 U	210 U	200 U	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Benzo (g,h,i) perylene	1,430	210 U	200 U	220 U	177 J	118 J	173 J	200 U	200 U	190 U	200 U	1,000 U	200 U	1,000 U
Polychlorinated Biphenyls (µg/kg)														
Aroclor-1016	20.0 U	21 U	20.0 U	22 U	21 U	21 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	20 U
Aroclor-1221	20.0 U	21 U	20.0 U	22 U	21 U	21 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	20 U
Aroclor-1232	20.0 U	21 U	20.0 U	22 U	21 U	21 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	20 U
Aroclor-1242	20.0 U	21 U	20.0 U	22 U	21 U	21 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	20 U
Aroclor-1248	20.0 U	21 U	20.0 U	22 U	21 U	21 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	20 U
Aroclor-1254	20.0 U	21 U	20.0 U	22 U	21 U	21 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	20 U
Aroclor-1260	20.0 U	21 U	20.0 U	22 U	21 U	21 U	20 U	20 U	20 U	19 U	20 U	20 U	20 U	180
Total Metals (mg/kg)														
Arsenic	6.84	7.59	4.99 J	2.60 J	1.92 J	3.08 J	4.01 J	3.01 J	6.07	5.34 J	4.37 J	4.77 J	4.33 J	5.04 J
Barium	839.0	147	492	521.0	195	204	211	192	313	266	781	3060	117	765
Cadmium	3.02 U	0.182 J	0.606 U	0.654 U	0.624 U	0.602 U	0.608 U	0.593 U	0.595 U	0.591 U	2.76 U	5.6 U	0.612 U	0.592 U
Chromium	20.4	33.1	21.3	27.4	25.6	28.1	10.7	8.33	23.2	20.4	18.9	20.7	18.8	17.1
Lead	49	21.7	22.7	14.7	17.2	19.7	20.4	16.9	15	14.8	14.9	27.0	12.4	40.3
Mercury	0.0345 J	0.0272 J	0.0566 J	0.0471 J	0.0272 J	0.0391 J	0.0828 J	0.0258 J	0.0232 J	0.0418 J	0.3 U	0.102 J	0.31 U	1.54
Selenium	0.586	0.523	0.554	0.539	0.538	0.745	0.82	0.146 J	0.363	0.502	0.318	0.324	0.384	0.399
Silver	2.42 U	2.45 U	2.42 U	2.62 U	2.49 U	2.41 U	2.43 U	2.37 U	2.38 U	2.37 U	2.21 U	2.25 U	2.45 U	2.37 U
TRPH-Florida PRO	66100	10900 J	11600 J	17800	10700 J	13800	57400	59000	9160 J	9630 J	9000 J	31300	8250 J	799000

ug/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
NA - Not analyzed
FD - Field duplicate (of SB-5)
J - Estimated
U - Undetected

TABLE 2
Analytical Results for 2004 Soil Samples - Building 82 Area
Union Carbide Corporation
South Charleston, West Virginia

Sample ID	SCFM-C-01-SOI	SCFM-C-02-SOI	SCFM-C-03-SOI	SCFM-C-04-SOI	SCFM-C-05-SOI	SCFM-C-06-SOI	SCFM-C-07-SOI	SCFM-C-08-SOI
Sample Date	05/26/04	05/26/04	05/27/04	05/25/04	05/26/04	05/26/04	05/25/04	05/27/04
Sample Depth	0.5 - 1.5	4 - 5	4 - 5	1 - 2	1 - 2	6.0 - 6.5	1 - 2	1.5 - 2.5
Chemical Name								
Volatile Organic Compounds (µg/kg)								
1,1,1-Trichloroethane	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
1,1,2,2-Tetrachloroethane	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
1,1,2-Trichloroethane	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
1,1-Dichloroethane	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
1,1-Dichloroethene	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
1,2-Dichloroethane	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
1,2-Dichloroethene (total)	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
1,2-Dichloropropane	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
1,4-Dioxane (P-Dioxane)	123 U	127 U	125 U	118 U	113 U	128 U	125 U	121 U
2-Butanone	12.3 U	12.7 U	12.5 U	11.8 U	11.3 U	12.8 U	12.5 U	12.1 U
2-Hexanone	12.3 U	12.7 U	12.5 U	11.8 U	11.3 U	12.8 U	12.5 U	12.1 U
4-Methyl-2-Pentanone	12.3 U	12.7 U	12.5 U	11.8 U	11.3 U	12.8 U	12.5 U	12.1 U
Acetone	12.3 U	12.7 U	18.8	11.8 U	11.3 U	12.8 U	12.5 U	12.1 U
Acrylonitrile	123 U	127 U	125 U	118 U	113 U	128 U	125 U	121 U
Benzene	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Bromodichloromethane	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Bromoform	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Bromomethane	12.3 U	12.7 U	12.5 U	11.8 U	11.3 U	12.8 U	12.5 U	12.1 U
Carbon Disulfide	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Carbon tetrachloride	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Chlorobenzene	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Chloroethane	12.3 U	12.7 U	12.5 U	11.8 U	11.3 U	12.8 U	12.5 U	12.1 U
Chloroform	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Chloromethane	12.3 U	12.7 U	12.5 U	11.8 U	11.3 U	12.8 U	12.5 U	12.1 U
cis-1,3-Dichloropropene	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Dibromochloromethane	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Ethylbenzene	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Methylene chloride	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Styrene	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Tetrachloroethene	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Toluene	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
trans-1,3-Dichloropropene	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Trichloroethene	6.15 U	6.33 U	6.23 U	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Vinyl Acetate	12.3 U	12.7 U	12.5 U	11.8 U	11.3 U	12.8 U	12.5 U	12.1 U
Vinyl chloride	12.3 U	12.7 U	12.5 U	11.8 U	11.3 U	12.8 U	12.5 U	12.1 U
Xylenes, Total	6.15 U	6.33 U	28.9	5.88 U	5.64 U	6.39 U	6.26 U	6.07 U
Semivolatile Organic Compounds (µg/kg)								
1,2,4-Trichlorobenzene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
1,2-Dichlorobenzene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
1,3-Dichlorobenzene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
1,4-Dichlorobenzene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
2,4,5-Trichlorophenol	1,000 U	5,200 U	1,030 U	957 U	927 U	1,040 U	1,010 U	994 U
2,4,6-Trichlorophenol	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
2,4-Dichlorophenol	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
2,4-Dimethylphenol	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
2,4-Dinitrophenol	1,000 U	5,200 U	1,030 U	957 U	927 U	1,040 U	1,010 U	994 U
2,4-Dinitrotoluene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
2,6-Dinitrotoluene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
2-Chloronaphthalene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
2-Chlorophenol	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
2-Methylnaphthalene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
2-Methylphenol	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
2-Nitroaniline	1,000 U	5,200 U	1,030 U	957 U	927 U	1,040 U	1,010 U	994 U
2-Nitrophenol	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
3,3'-Dichlorobenzidine	401 U	2,080 U	410 U	383 U	371 U	414 U	405 U	397 U
3-Methylphenol	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
3-Nitroaniline	1,000 U	5,200 U	1,030 U	957 U	927 U	1,040 U	1,010 U	994 U
4,6-Dinitro-2-methylphenol	1,000 U	5,200 U	1,030 U	957 U	927 U	1,040 U	1,010 U	994 U
4-Bromophenyl phenyl ether	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
4-Chloro-3-methylphenol	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
4-Chloroaniline	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
4-Chlorophenyl phenyl ether	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
4-Nitroaniline	1,000 U	5,200 U	1,030 U	957 U	927 U	1,040 U	1,010 U	994 U
4-Nitrophenol	1,000 U	5,200 U	1,030 U	957 U	927 U	1,040 U	1,010 U	994 U
Acenaphthene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Acenaphthylene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Anthracene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Benzo (a) anthracene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Benzo (a) pyrene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Benzo (b) fluoranthene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Benzo (g,h,i) perylene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Benzo(k)fluoranthene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Bis (2-chloroethoxy) methane	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Bis (2-chloroethyl) ether	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Bis (2-chloroisopropyl) ether	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Bis (2-ethylhexyl) phthalate	200 U	1,040 U	499	191 U	623	207 U	202 U	199 U
Butyl benzylphthalate	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Carbazole	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Chrysene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Dibenzo (a,h) anthracene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Dibenzofuran	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Diethyl phthalate	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Dimethyl phthalate	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Di-n-butylphthalate	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Di-n-octylphthalate	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Fluoranthene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Fluorene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Hexachlorobenzene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Hexachlorobutadiene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Hexachlorocyclopentadiene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Hexachloroethane	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Indeno (1,2,3-c,d) pyrene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Isophorone	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Naphthalene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Nitrobenzene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
n-Nitrosodi-n-propylamine	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
n-Nitrosodiphenylamine	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Pentachlorophenol	1,000 U	5,200 U	1,030 U	957 U	927 U	1,040 U	1,010 U	994 U
Phenanthrene	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Phenol	200 U	1,040 U	205 U	191 U	185 U	207 U	202 U	199 U
Pyrene	200 U	1,040 U	301	191 U	185 U	207 U	202 U	199 U

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TABLE 2
Analytical Results for 2004 Soil Samples - Building 82 Area
Union Carbide Corporation
South Charleston, West Virginia

Sample ID	SCFM-C-01-SOI	SCFM-C-02-SOI	SCFM-C-03-SOI	SCFM-C-04-SOI	SCFM-C-05-SOI	SCFM-C-06-SOI	SCFM-C-07-SOI	SCFM-C-08-SOI
Sample Date	05/26/04	05/26/04	05/27/04	05/25/04	05/26/04	05/26/04	05/25/04	05/27/04
Sample Depth	0.5 - 1.5	4 - 5	4 - 5	1 - 2	1 - 2	6.0 - 6.5	1 - 2	1.5 - 2.5
Chemical Name								
Polychlorinated Biphenyls (µg/kg)								
Aroclor-1016	20.3 U	20.4 U	20 U	19.1 U	18.5 U	21.1 U	20.4 U	20 U
Aroclor-1221	20.3 U	20.4 U	20 U	19.1 U	18.5 U	21.1 U	20.4 U	20 U
Aroclor-1232	20.3 U	20.4 U	20 U	19.1 U	18.5 U	21.1 U	20.4 U	20 U
Aroclor-1242	20.3 U	20.4 U	20 U	19.1 U	18.5 U	21.1 U	20.4 U	20 U
Aroclor-1248	20.3 U	20.4 U	20 U	19.1 U	18.5 U	21.1 U	20.4 U	20 U
Aroclor-1254	20.3 U	20.4 U	20 U	19.1 U	18.5 U	21.1 U	20.4 U	20 U
Aroclor-1260	20.3 U	20.4 U	149	19.1 U	18.5 U	21.1 U	20.4 U	20 U
Total Metals (mg/kg)								
Arsenic	4.62	5.65	5.27	2.59	3.45	6.73	1.54	3.41
Barium	95.3	68.1	474	38.2	113	155	22.7	93.3
Cadmium	0.585 U	0.633 U	2.5	0.565 U	0.538 U	0.603 U	0.626 U	0.557 U
Chromium	22.2	13.9	27	8.54	14.2	19.9	6.62	18.6
Lead	16	6.57	490	7.69	6.85	14.6	5.79	14.1
Mercury	0.307 U	0.316 U	0.311 U	0.294 U	0.282 U	0.32 U	0.313 U	0.303 U
Nickel	21.5	9.92	18.9	10.7	7.92	18	6.94	17.8
Selenium	0.187	0.199	0.399	0.123	0.148	0.591	0.118	0.243
Silver	2.34 U	2.53 U	2.4 U	2.26 U	2.15 U	2.41 U	2.5 U	2.23 U

ug/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
NA - Not analyzed
U - Undetected

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TABLE 3
Analytical Results for 2010 Surface Soil Samples
Union Carbide Corporation
South Charleston, West Virginia

Sample ID	SS-01		SS-02		SS-03		SS-04		SS-05		SS-06		SS-07		SS-08		SS-08		SS-09		SS-10		SS-11		SS-11		SS-12	
Sample Date	9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010	
Sample Depth	1.5-2.5		0.5-1.5		1.5-2.5		1-2		0.5-1.5		2.5-3.5		2-3		1-2		1-2		1-2		1-2		1-2		1-2		0-1	
Chemical Name																	Field Duplicate								Field Duplicate			
Volatile Organic Compounds (µg/kg)																												
1,1,1-Trichloroethane	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
1,1,2,2-Tetrachloroethane	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
1,1,2-Trichloroethane	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
1,1-Dichloroethane	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
1,1-Dichloroethene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
1,2,4-Trichlorobenzene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	UL	5.98	U	4.48	U	4.61	U	4.93	U
1,2-Dichlorobenzene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	UL	5.98	U	4.48	U	4.61	U	4.93	U
1,2-Dichloroethane	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
1,2-Dichloropropane	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
1,3-Dichlorobenzene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	UL	5.98	U	4.48	U	4.61	U	4.93	U
1,4-Dichlorobenzene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	UL	5.98	U	4.48	U	4.61	U	4.93	U
2-Butanone	28.9	U	27.3	U	28.1	U	25.6	U	26.6	U	27.9	U	29.7	U	27.4	U	27.1	U	25	U	29.9	U	22.4	U	23	U	24.6	U
2-HEXANONE	11.5	U	10.9	U	11.2	U	10.2	U	10.6	U	11.2	U	11.9	U	11	U	10.8	U	10	U	12	U	8.97	U	9.21	U	9.85	U
4-METHYL-2-PENTANONE	11.5	U	10.9	U	11.2	U	10.2	U	10.6	U	11.2	U	11.9	U	11	U	10.8	U	10	U	12	U	8.97	U	9.21	U	9.85	U
ACETONE	115	U	109	U	112	U	102	U	106	U	112	U	119	U	110	U	108	U	100	U	120	U	89.7	U	92.1	U	98.5	U
ACRYLONITRILE	115	U	109	U	112	U	102	U	106	U	112	U	119	U	110	U	108	U	100	U	120	U	89.7	U	92.1	U	98.5	U
Benzene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	19.3		5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
Bromodichloromethane	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
Bromoform	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
Bromomethane	11.5	U	10.9	U	11.2	U	10.2	U	10.6	U	11.2	U	11.9	U	11	U	10.8	U	10	U	12	U	8.97	U	9.21	U	9.85	U
CARBON DISULFIDE	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
Carbon tetrachloride	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
Chlorobenzene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
Chloroethane	11.5	U	10.9	U	11.2	U	10.2	U	10.6	U	11.2	U	11.9	U	11	U	10.8	U	10	U	12	U	8.97	U	9.21	U	9.85	U
Chloroform	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
Chloromethane	11.5	U	10.9	U	11.2	U	10.2	U	10.6	U	11.2	U	11.9	U	11	U	10.8	U	10	U	12	U	8.97	U	9.21	U	9.85	U
cis-1,2-Dichloroethylene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
cis-1,3-Dichloropropene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
Dibromochloromethane	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
Ethylbenzene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
Methylene chloride	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
Styrene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
TCE	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
tert-Butyl Methyl Ether	11.5	U	10.9	U	11.2	U	10.2	U	10.6	U	11.2	U	11.9	U	11	U	10.8	U	10	U	12	U	8.97	U	9.21	U	9.85	U
Tetrachloroethene	5.77	U	8.27		5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
Toluene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	6.4		4.61	U	4.93	U
Trans-1,2-DCE	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
trans-1,3-Dichloropropene	5.77	U	5.47	U	5.62	U	5.12	U	5.32	U	5.58	U	5.95	U	5.49	U	5.42	U	5	U	5.98	U	4.48	U	4.61	U	4.93	U
VINYL ACETATE	11.5	UL	10.9	U	11.2	UL	10.2	UL	10.6	UL	11.2	UL	11.9	U	11	UL	10.8	UL	10	UL	12	UL	8.97	UL	9.21	UL	9.85	U
Vinyl chloride	11.5	U	10.9	U	11.2	U	10.2	U	10.6	U	11.2	U	16.6	K	11	U	10.8	U	10	U	12	U	8.97	U	9.21	U	9.85	U
XYLENES, TOTAL	11.5	U	10.9	U	11.2	U	10.2	U	10.6	U	11.2	U	11.9	U	11	U	10.8	U	10	U	12	U	8.97	U	9.21	U	9.85	U
Semivolatile Organic Compounds (µg/kg)																												
2,4,5-Trichlorophenol	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
2,4,6-Trichlorophenol	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
2,4-Dichlorophenol	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
2,4-Dimethylphenol	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
2,4-Dinitrophenol	946	U			10100	U	1000	U	1030	U	1030	U	5520	U	953	U	1160	U	1080	U	1140	U	979	U	938	U	984	U
2,4-Dinitrotoluene	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
2,6-Dinitrotoluene	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
2-Chloronaphthalene	189	U	336	UL	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
2-Chlorophenol	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
2-Methylphenol	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
2-Nitroaniline	946	U	1680	U	10100	U	1000	U	1030	U	1030	U	5520	U	953	U	1160	U	1080	U	1140	U	979	U	938	U	984	U
2-Nitrophenol	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
3,3'-Dichlorobenzidine	379	U	671	U	4040	U	402	U	414	U	412	U	2210	U	381	U	465	U	433	U	455	U	392	U	375	U	394	U
3-,4-METHYLPHENOL	189	U	336	UL	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
3-Nitroaniline	946	U	1680	U	10100	U	1000	U	1030	U	1030	U	5520	U	953	U	1160	U	1080	U	1140	U	979	U	938	U	984	U
4,6-Dinitro-2-methylphenol	946	U	1680	U	10100	U	1000	U	1030	U	1030	U	5520	U	953	U	1160	U	1080	U	1140	U	979	U	938	U	984	U
4-Bromophenyl phenyl ether	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
4-Chloro-3-methylphenol	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
4-Chloroaniline	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
4-Chlorophenyl phenyl ether	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
4-Nitroaniline	946	U	1680	U	10100	U	1000	U	1030	U	1030	U	5520	U	953	U	1160	U	1080	U	1140	U	979	U	938	U	984	U
4-Nitrophenol	946	U	1680	U	10100	U	1000	U	1030	U	1030	U	5520	U	953	U	1160	U	1080	U	1140	U	979	U	938	U	984	U
Bis (2-chloroethoxy) methane	189	U	336	UL	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	UL	188	UL	197	U
Bis (2-chloroethyl) ether	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Bis (2-chloroisopropyl) ether	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U

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TABLE 3
Analytical Results for 2010 Surface Soil Samples
Union Carbide Corporation
South Charleston, West Virginia

Sample ID	SS-01		SS-02		SS-03		SS-04		SS-05		SS-06		SS-07		SS-08		SS-08		SS-09		SS-10		SS-11		SS-11		SS-12	
Sample Date	9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010		9/23/2010	
Sample Depth	1.5-2.5		0.5-1.5		1.5-2.5		1-2		0.5-1.5		2.5-3.5		2-3		1-2		Field Duplicate		1-2		1-2		1-2		Field Duplicate		0-1	
Chemical Name																												
Bis (2-ethylhexyl) phthalate	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Butyl benzylphthalate	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
CARBAZOLE	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Dibenzofuran	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Diethyl phthalate	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Dimethyl phthalate	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Di-n-butylphthalate	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Di-n-octylphthalate	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Hexachlorobenzene	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Hexachlorobutadiene	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Hexachlorocyclopentadiene	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Hexachloroethane	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Isophorone	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Nitrobenzene	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
n-Nitrosodi-n-propylamine	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
n-Nitrosodiphenylamine	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
Pentachlorophenol	946	U	1680	U	10100	U	1000	U	1030	U	1030	U	5520	U	953	U	1160	U	1080	U	1140	U	979	U	938	U	984	U
Phenol	189	U	336	U	2020	U	201	U	207	U	206	U	1100	U	191	U	233	U	216	U	227	U	196	U	188	U	197	U
1-methylnaphthalene	24.4		111	K	172		2.72	U	11.9		3.23	U	44.2		3.3	U	3.15	U	7.42		3.21	U	3.25	U	32.7	U	3.14	U
2-Methylnaphthalene	22.8		153	K	212		2.72	U	12.4		3.23	U	62.6		3.3	U	3.15	U	8.65		3.21	U	3.25	U	32.7	U	3.14	U
Acenaphthene	3.06	U	156	K	1720		2.72	U	3.18	U	3.23	U	11		3.3	U	3.15	U	3.45	U	3.21	U	3.25	U	32.7	U	3.14	U
Acenaphthylene	6.95		47.9	K	341		2.72	U	8.31		3.23	U	8.33		3.3	U	3.15	U	3.45	U	3.21	U	3.25	U	32.7	U	3.14	U
Anthracene	7.43		681		6530		2.86		10.9		3.23	U	8.25		3.3	U	3.15	U	3.45	U	3.21	U	3.25	U	43.6	J	3.14	U
Benzo (a) anthracene	39.5		2180		16700		11.2		52.8		4.42		20.6		3.3	U	3.15	U	3.46		3.21	U	3.25	U	363	J	3.14	U
Benzo (a) pyrene	40.5		1970		14800		11.1		53.8		4.46		21		3.3	U	3.15	U	3.45	U	3.21	U	3.25	U	465	J	3.14	U
Benzo (b) fluoranthene	52.5		1820		14000		11.2		48.2		5.54		26.6		3.3	U	3.15	U	4.52		3.21	U	3.25	U	533	J	3.14	U
Benzo (g,h,i) perylene	37.4		1300		9440		8.41		43.8		4.62		19.9		3.3	U	3.15	U	3.45	U	3.21	U	3.25	U	406	J	3.14	U
Benzo(k)fluoranthene	37.4		1660		12900		11		49.6		4.52		19.1		3.3	U	3.15	U	3.45	U	3.21	U	3.25	U	455	J	3.14	U
Chrysene	67.4		2030		16000		11.7		59.6		6.18		33		3.3	U	3.15	U	5.81		3.21	U	3.25	U	508	J	3.14	U
Dibenzo (a,h) anthracene	10.4		391		3230		2.72	U	12.5		3.23	U	6.98	U	3.3	U	3.15	U	3.45	U	3.21	U	3.25	U	119	J	3.14	U
Fluoranthene	115		4480		34500		25.5		83.3		9.72		56.2		3.3	U	3.15	U	6.67		3.44		5.12	J	849	J	3.14	U
Fluorene	3.06	U	155	K	1940		2.72	U	3.18	U	3.23	U	8.67		3.3	U	3.15	U	3.45	U	3.21	U	3.25	U	32.7	U	3.14	U
Indeno (1,2,3-c,d) pyrene	29.9		1210		9290		7.27		38.8		3.59		15.5		3.3	U	3.15	U	3.45	U	3.21	U	3.25	U	368	J	3.14	U
Naphthalene	16.6		137	K	468		2.72	U	10.2		3.23	U	62.8		3.3	U	3.15	U	6.63		3.23		3.25	U	32.7	U	3.14	U
Phenanthrene	78.1		2120		21000		8.01		37		5.63		53.7		3.3	U	3.15	U	7.86		4.19		3.5	J	227	J	3.14	U
Pyrene	78.5		3580		26000		18.1		67.2		7.43		54.2		3.3	U	3.15	U	5.19		3.21	U	3.25	U	669	J	3.14	U
1,4-DIOXANE (P-DIOXANE)	115	U	203	U	1220	U	122	U	125	U	125	U	669	U	115	U	141	U	131	U	138	U	119	U	114	U	119	U
Polychlorinated Biphenyls (µg/kg)																												
Aroclor-1016	19.2	U	16.7	U	19.9	U	18.2	U	19.6	U	18.9	U	22.5	U	21.9	U	20	U	18.9	U	20.4	U	20.2	U	20.7	U	19.5	U
Aroclor-1221	19.2	U	16.7	U	19.9	U	18.2	U	19.6	U	18.9	U	22.5	U	21.9	U	20	U	18.9	U	20.4	U	20.2	U	20.7	U	19.5	U
Aroclor-1232	19.2	U	16.7	U	19.9	U	18.2	U	19.6	U	18.9	U	22.5	U	21.9	U	20	U	18.9	U	20.4	U	20.2	U	20.7	U	19.5	U
Aroclor-1242	19.2	U	16.7	U	19.9	U	18.2	U	19.6	U	18.9	U	22.5	U	21.9	U	20	U	18.9	U	20.4	U	20.2	U	20.7	U	19.5	U
Aroclor-1248	19.2	U	16.7	U	19.9	U	18.2	U	19.6	U	18.9	U	22.5	U	21.9	U	20	U	18.9	U	20.4	U	20.2	U	20.7	U	19.5	U
Aroclor-1254	19.2	U	16.7	U	19.9	U	18.2	U	19.6	U	18.9	U	22.5	U	21.9	U	20	U	18.9	U	20.4	U	20.2	U	20.7	U	19.5	U
Aroclor-1260	19.2	U	56.3		249		18.2	U	19.6	U	18.9	U	22.5	U	21.9	U	20	U	18.9	U	20.4	U	20.2	U	20.7	U	19.5	U
Total Metals (mg/kg)																												
Arsenic	4.62		7.33		5.58		8.7		3.53		1.77	U	1.81	U	2.82		3.67		6.64		2.55		2.65		3.37		6.34	
Barium	2100		705		598		255		2020		481		328		86.2	J	189	J	644		177		115		99.2		422	
Cadmium	0.406	U	0.383	U	0.792		0.415	U	0.414	U	0.451	U	0.447	U	0.435	U	0.432	U	0.452	U	0.438	U	0.417	U	0.417	U	0.394	U
Chromium	13.5		13.1	L	15.8		18.8		13.9		16.3		17.4		17		17		15		15.1		14.8		14.5		16.5	
Lead	33.2		37.7	L	37.5		15.2		42.6		17.6		19.1		12.2		13.3		16.2		14.3		13.2		13.2		40.1	
Mercury	0.27	U	0.262	U	0.683	J	0.266	U	0.291	U	0.293	U	2.22		0.295	U	0.297	U	0.297	U	0.292	U	0.279	U	0.273	U	0.275	U
Nickel	13.9		17.3	L	16.3		30		14.8		14.2		15.7		12.7		12.7		13.8		14		14.9		14.8		17.6	
Selenium	1.05	U	1.06	U	1.05	U	1.06	U	1.13	U	1.18	U	1.21	U	1.15	U	1.12	U	1.17	U	1.16	U	1.14	U	1.14	U	1.11	U
Silver	1.62	U	1.53	U	1.52	U	1.66	U	1.66	U	1.8	U	1.79	U	1.74	U	1.73	U	1.81	U	1.75	U	1.78	U	1.67	U	1.58	U

ug/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
NA - Not analyzed
U - Undetected
UL - Undetected at the low-biased quantitation limit provided
K - Biased high

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Table 4
Analytical Results for May 2011 Focused Polynuclear Aromatic Hydrocarbon Soil Sampling
Union Carbide Corporation
South Charleston, West Virginia

Sample ID Sample Date Sample Depth Chemical Name[a]	Screening Criteria - Residential RSL (1)	Screening Criteria - Trespasser RSL (2)	Screening Criteria - Industrial RSL (1)	SS-03 5/6/2011 0-1	SS-13 5/6/2011 0-1	SS-13 5/6/2011 0-1 Field Duplicate	SS-13 5/6/2011 1.5 - 2.5	SS-14 5/6/2011 0-1	SS-14 5/6/2011 1.5 - 2.5	SS-15 5/6/2011 0-1	SS-15 5/6/2011 1.5 - 2.5	SS-15 5/6/2011 1.5 - 2.5 Field Duplicate	SS-16 5/6/2011 0-1	SS-16 5/6/2011 1.5 - 2.5	SS-17 5/6/2011 1.5 - 2.5	SS-18 5/6/2011 1.5 - 2.5	SS-20 5/6/2011 1.5 - 2.5
Polynuclear Aromatic Hydrocarbons (µg/kg)																	
1-Methylnaphthalene	2.20E+06 c	1.5E+07 c	9.90E+06 c	2.72 U	2.71 U	2.66 U	194	2.77 U	165	2.79 U	33	39	2.74 U	292	237 U	163	80
2-Methylnaphthalene	31,000 n	208,654 n	410,000 n	2.72 U	2.71 U	2.66 U	236	2.77 U	211	2.79 U	37	49	2.74 U	385	237 U	188	106
Acenaphthene	340,000 n	2.3E+06 n	3.30E+06 n	2.72 U	2.71 U	2.66 U	1,620	2.77 U	1,630	2.79 U	187	204	2.74 U	870	1,550	1,580	286
Acenaphthylene	340,000 n	2.3E+06 n	3.30E+06 n	2.72 U	2.71 U	2.66 U	173	2.77 U	375	2.79 U	29 U	19	2.74 U	221	342	207	34
Anthracene	1.70E+06 n	1.1E+07 n	1.70E+07 n	2.72 U	2.71 U	2.66 U	4,960	2.77 U	7,070	3.34	837	708	2.74 U	3,060	6,190	5,280	875
Benzo (a) anthracene	15,000 c	100,962 c	210,000 c	2.72 U	2.71 U	2.66 U	12,200	2.77 U	**17,800**	23.1	2,740	2,490	2.74 U	9,660	**16,900**	14,700	2,830
Benzo (a) pyrene	1,500 c	10,096 c	21,000 c	2.72 U	2.71 U	2.66 U	**11,000**	2.77 U	**15,100**	25.4	**2,250**	**2,090**	2.74 U	**8,400**	**14,500**	**13,100**	**2,510**
Benzo (b) fluoranthene	15,000 c	100,962 c	210,000 c	2.72 U	2.71 U	2.66 U	10,800	2.77 U	13,600	25.2	2,080	2,010	2.74 U	8,540	**15,300**	13,200	2,530
Benzo (g,h,i) perylene	170,000 n	1.1E+06 n	1.70E+06 n	2.72 U	2.71 U	2.66 U	6,600	2.77 U	9,540	20.5	1,440	1,330	2.74 U	5,950	8,550	8,260	1,560
Benzo(k)fluoranthene	150,000 c	1.0E+06 c	2.10E+06 c	2.72 U	2.71 U	2.66 U	10,800	2.77 U	14,700	27.2	2,210	1,990	2.74 U	8,600	14,500	12,800	2,620
Chrysene	1.50E+06 c	1.0E+07 c	2.10E+07 c	2.72 U	2.71 U	2.66 U	12,600	3.00	17,300	25.5	2,700	2,420	2.74 U	9,960	17,500	16,000	2,830
Dibenzo (a,h) anthracene	1,500 c	10,096 c	21,000 c	2.72 U	2.71 U	2.66 U	**2,630**	2.77 U	**5,340**	6.82	531	482	2.74 U	**2,410**	**3,510**	**3,400**	460
Fluoranthene	230,000 n	1.5E+06 n	2.20E+06 n	5.8	2.71 U	2.66 U	25,600	5.70	35,600	43.3	5,550	5,080	8.72	20,600	42,400	29,900	5,190
Fluorene	230,000 n	1.5E+06 n	2.20E+06 n	2.72 U	2.71 U	2.66 U	1,690	2.77 U	1,760	2.79 U	190	188	2.74 U	874	1,750	1,610	249
Indeno (1,2,3-c,d) pyrene	15,000 c	100,962 c	210,000 c	2.72 U	2.71 U	2.66 U	6,670	2.77 U	9,100	18.8	1,350	1,230	2.74 U	5,520	8,910	8,430	1,400
Naphthalene	360,000 c	2.4E+06 c	1.80E+06 c	2.72 U	2.71 U	2.66 U	612	2.77 U	395	2.79 U	38	51	2.74 U	407	642	457	169
Phenanthrene	1.70E+06 n	1.1E+07 n	1.70E+07 n	2.72 U	2.71 U	2.66 U	16,100	2.77 U	19,200	11.0	2,620	2,690	5.49	11,200	20,700	16,900	2,870
Pyrene	170,000 n	1.1E+06 n	1.70E+06 n	3.35	2.71 U	2.66 U	19,200	3.58	27,800	31.9	4,250	3,990	5.45	15,400	25,100	21,900	3,770

Notes:
RSL = Regional Screening Level
µg/kg = micrograms per kilogram
Bold results exceed the residential screening level.
Bold, underlined results exceed the trespasser screening level.
c = Carcinogenic
n = Non-Carcinogenic
U - Undetected

(1) Screening levels based on USEPA Regional Screening Levels (June 2011) an excess lifetime cancer risk of 1 x 10^{-4} and a hazard quotient of 0.1.
(2) Screening levels for a trespasser scenario are based on residential RSLs (as detailed in this table), and adjusted for an exposure frequency of 52 days/year.
* Benzo (a) pyrene equivalents calculated using Toxicity Equivalence Factors published in USEPA's Regional Screening Level User Guide (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm). Additionally, 1/2 the reporting limit was used for non-detect values.
** One Benzo (a) pyrene equivalent was calculated for normal and field duplicate samples. Between the two samples, the maximum detected concentration or the lowest non-detect concentration was selected for inclusion in the toxicity equivalency calculation.

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TABLE 5
Analytical Results for Groundwater Piezometer Samples - Buildings 82 and 603 Area
Union Carbide Corporation
South Charleston, West Virginia

Station ID	SCFM-PZ039					SCFM-PZ040		SCFM-PZ041		
Sample Date	02/27/03	07/20/04	11/03/04	04/24/07	10/15/10	02/26/03	10/15/10	02/26/03	2/4/2010	10/15/10
Chemical Name										
Volatile Organic Compounds (µg/L)										
1,1,2,2-Tetrachloroethane	5 U	5 U	5 U	1 U	1 U	5 U	1 U	5 U	1 U	1 U
1,1,2-Trichloroethane	5 U	5 U	5 U	1 U	1 U	5 U	1 U	5 U	1 U	1 U
1,1-Dichloroethane	5 U	5 U	5 U	1 U	1 U	5 U	1 U	5 U	1 U	1 U
1,1-Dichloroethene	5 U	5 U	5 U	1 U	1 U	5 U	1 U	5 U	1 U	1 U
1,2-Dichloroethane	5 U	5 U	5 U	1 U	1 U	5 U	1 U	5 U	1 U	1 U
1,2-Dichloroethene (total)	5 U	5 U	5 U	NA	NA	5 U	NA	5 U	1 U	NA
1,2-Dichloropropane	5 U	5 U	5 U	1 U	1 U	5 U	1 U	5 U	1 U	1 U
1,2,4-Trichlorobenzene	5.68 U	5.26 U	5.56 U	1 U	1 U	5.43 U	1 U	5.18 U	1 U	1 U
1,2-Dichlorobenzene	5.68 U	5.26 U	5.56 U	1 U	1 U	5.43 U	1 U	5.18 U	1 U	1 U
1,3-Dichlorobenzene	5.68 U	5.26 U	5.56 U	1 U	1 U	5.43 U	1 U	5.18 U	1 U	1 U
1,4-Dichlorobenzene	5.68 U	5.26 U	5.56 U	1 U	1 U	5.43 U	1 U	5.18 U	1 U	1 U
1,4-Dioxane (P-Dioxane)	100 U	100 U	100 U	NA	100 R	100 U	100 R	100 U	100 U	100 R
2-Butanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	5 U	5 U	10 U	5 U	10 U	5 U	5 U
4-Methyl-2-Pentanone	10 U	10 U	10 U	5 U	5 U	10 U	5 U	10 U	5 U	5 U
Acetone	11.8	10 U	10 U	25 U	25 U	10 U	25 U	10 U	25 U	25 U
Benzene	5 U	5 U	5 U	1 U	1 U	5 U	1 U	5 U	1 U	1 U
Carbon Disulfide	5 U	5 U	5 U	1 U	1 U	5 U	1 JL	5 U	1 U	1 U
Carbon tetrachloride	5 U	5 U	5 U	1 U	1 U	5 U	6.01 K	37	79.7	66.2 K
Chlorobenzene	5 U	5 U	5 U	1 U	1 U	5 U	1 U	5 U	1 U	1 U
Chloroform	5 U	5 U	5 U	1 U	1 U	5 U	1 U	5 U	8.25	6.83 K
Ethylbenzene	5 U	5 U	5 U	1 U	1 U	5 U	1 U	5 U	1 U	1 U
Methylene chloride	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Styrene	5 U	5 U	5 U	1 U	1 U	5 U	1 U	5 U	1 U	1 U
Tetrachloroethene	5 U	5 U	5 U	2.56	2.57	5 U	1 U	5 U	1 U	1 U
Toluene	5 U	5 U	5 U	1 U	1 U	5 U	1 U	5 U	1 U	1 U
Trichloroethene	5 U	5 U	5 U	1.64	1.22	5 U	1 U	5 U	1 U	1 U
Vinyl chloride	10 U	10 U	10 U	1 U	1 U	10 U	1 U	10 U	1 U	1 U
Xylenes, Total	8.03	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Semivolatile Organic Compounds (µg/L)										
2,4-Dichlorophenol	5.68 U	5.26 R	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
2,4-Dimethylphenol	5.68 U	5.26 R	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
2-Chlorophenol	5.68 U	5.26 R	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
2-Methylnaphthalene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
2-Methylphenol	5.68 U	5.26 R	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
3-,4-Methylphenol	5.68 U	5.26 R	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
4-Chloroaniline	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Acenaphthene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Acenaphthylene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Anthracene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Benzo (a) anthracene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Benzo (a) pyrene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Benzo (b) fluoranthene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Benzo (g,h,i) perylene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Benzo(k)fluoranthene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Bis (2-chloroethoxy) methane	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Bis (2-chloroethyl) ether	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Bis (2-chloroisopropyl) ether	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Bis (2-ethylhexyl) phthalate	5.68 U	5.26 U	5.56 U	10.4	NA	5.43 U	NA	5.18 U	NA	NA
Butyl benzylphthalate	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Chrysene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Di-n-butylphthalate	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Di-n-octylphthalate	5.68 U	5.26 U	5.56 U	5.62 U	NA	8.95	NA	5.18 U	NA	NA
Fluoranthene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Fluorene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Hexachlorobenzene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Indeno (1,2,3-c,d) pyrene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Isophorone	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Naphthalene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Phenanthrene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Phenol	180	5.26 R	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Pyrene	5.68 U	5.26 U	5.56 U	5.62 U	NA	5.43 U	NA	5.18 U	NA	NA
Total Metals (mg/L)										
Arsenic	0.004 U	0.00428 L	NA	NA	NA	0.004 U	NA	0.004 U	NA	NA
Barium	0.204	0.793 K	NA	NA	NA	0.0635	NA	0.169	NA	NA
Cadmium	0.01 U	0.01 U	NA	NA	NA	0.01 U	NA	0.01 U	NA	NA
Chromium	0.0603	0.0432	NA	NA	NA	0.02 U	NA	0.049	NA	NA
Lead	0.005 U	0.00826	NA	NA	NA	0.005 U	NA	0.005 U	NA	NA
Mercury	2.87E-04 U	2.00E-04 U	NA	NA	NA	2.46E-04 U	NA	2.46E-04 U	NA	NA
Nickel	0.04 U	0.04 U	NA	NA	NA	0.04 U	NA	0.0501	NA	NA
Selenium	0.00334	0.00175 L	NA	NA	NA	0.0011	NA	0.00597	NA	NA
Silver	0.01 U	0.01 U	NA	NA	NA	0.01 U	NA	0.01 U	NA	NA
Dissolved Metals (mg/L)										
Arsenic	NA	NA	NA	NA	NA	0.004 U	NA	0.004 U	NA	NA
Barium	NA	NA	NA	NA	NA	0.0553	NA	0.145	NA	NA
Chromium	NA	NA	NA	NA	NA	0.02 U	NA	0.02 U	NA	NA
Lead	NA	NA	NA	NA	NA	0.005 U	NA	0.005 U	NA	NA
Mercury	NA	NA	NA	NA	NA	2.57E-04 U	NA	2.38E-04 U	NA	NA
Nickel	NA	NA	NA	NA	NA	0.04 U	NA	0.04 U	NA	NA
Selenium	NA	NA	NA	NA	NA	1.00E-03 U	NA	0.00683	NA	NA
Silver	NA	NA	NA	NA	NA	0.01 U	NA	0.01 U	NA	NA

NA - Not analyzed
L - Biased Low
J - Estimated
K - Biased High
R - Rejected
U - Undetected

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TABLE 6
Analytical Results for Groundwater Well Samples -
Buildings 82 and 603 Area
Union Carbide Corporation
South Charleston, West Virginia

Sample ID	SCFM-C-01-GW	SCFM-C-02-GW	SCFM-C-03-GW	SCFM-C-04-GW	SCFM-C-05-GW	SCFM-C-06-GW	SCFM-C-07-GW	SCFM-C-08-GW	SCFM-C-09-GW	SCFM-C-10-GW	SCFM-C-11-GW	SCFM-C-12-GW	SCFM-C-13-GW	SCFM-C-14-GW	MW021					MW028D	
Sample Date	05/26/04	05/26/04	05/27/04	05/25/04	05/26/04	05/26/04	05/25/04	05/27/04	05/26/04	05/26/04	05/26/04	05/27/04	05/27/04	05/27/04	10/02/06	04/24/07	10/09/07	04/07/08	10/13/08	02/04/10	10/15/10
Chemical Name																					
Volatile Organic Compounds (µg/L)																					
1,1,1-Trichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethene (total)	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dioxane	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	2 U	100 R	100 R	100 R	10.4 U	100 U	100 R
2-Butanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-Pentanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Acrylonitrile	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U
Benzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	7.54	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	3.8 B	6.62	1 U	1 U
Bromodichloromethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromoform	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Carbon Disulfide	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UL
Carbon tetrachloride	5 U	5 U	5 U	5 U	7.36	5 U	5 U	21.3	5 U	5 U	5 U	5 U	5 U	5 U	14.6	24.4	36.3	52.1	60.7	10.6	5.47 K
Chlorobenzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	5 U	5 U	5 U	5 U	5 U	5 U	5 U	21.5	15	5 U	5 U	5 U	5 U	5.74	6.56	4.65	6.48	6.74	8.26	1.79	2.14 K
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,3-Dichloropropene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethyl benzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene chloride	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Styrene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl Acetate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UL	10 U	10 JJ	10 UJ	10 U	10 U	10 UL
Vinyl chloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	18.3	10 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylenes, Total	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Semivolatile Organic Compounds (µg/L)																					
1,2,4-Trichlorobenzene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	1 U	1 U	1 U	1 U	1 U	NA	NA
1,2-Dichlorobenzene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	1 U	1 U	1 U	1 U	1 U	NA	NA
1,3-Dichlorobenzene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	1 U	1 U	1 U	1 U	1 U	NA	NA
1,4-Dichlorobenzene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	1 U	1 U	1 U	1 U	1 U	NA	NA
2,4,5-Trichlorophenol	25 U	26.6 U	28.7 U	25.5 U	26 U	258 U	31.3 U	25.5 U	26.6 U	27.2 U	26.6 U	25 U	29.1 U	29.8 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
2,4,6-Trichlorophenol	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
2,4-Dichlorophenol	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
2,4-Dimethylphenol	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
2,4-Dinitrophenol	25 U	26.6 U	28.7 U	25.5 U	26 U	258 U	31.3 U	25.5 U	26.6 U	27.2 U	26.6 U	25 U	29.1 U	29.8 U	26.9 U	27.8 U	62.5 U	27.5 U	26 UJ	NA	NA
2,4-Dinitrotoluene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
2,6-Dinitrotoluene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
2-Chloronaphthalene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 UL	12.5 U	5.49 U	5.21 U	NA	NA
2-Chlorophenol	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
2-Methylnaphthalene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
2-Methylphenol	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
2-Nitroaniline	25 U	26.6 U	28.7 U	25.5 U	26 U	258 U	31.3 U	25.5 U	26.6 U	27.2 U	26.6 U	25 U	29.1 U	29.8 U	26.9 U	27.8 U	62.5 U	27.5 U	26 U	NA	NA
2-Nitrophenol	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
3,3'-Dichlorobenzidine	10 U	10.6 U	11.5 U	10.2 U	10.4 U	103 U	12.5 U	10.2 U	10.6 U	10.9 U	10.6 U	10 U	11.6 U	11.9 U	5.38 UJ	5.56 U	12.5 U	5.49 U	5.21 UJ	NA	NA
3-Methylphenol	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	NA	NA	NA	NA	NA	NA	NA
3,4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10.8 U	5.56 U	12.5 U	NA	NA	NA	NA
3-Nitroaniline	25 U	26.6 U	28.7 U	25.5 U	26 U	258 U	31.3 U	25.5 U	26.6 U	27.2 U	26.6 U	25 U	29.1 U	29.8 U	26.9 U	27.8 U	62.5 U	27.5 U	26 U	NA	NA
4,6-Dinitro-2-methylphenol	25 U	26.6 U	28.7 U	25.5 U	26 U	258 U	31.3 U	25.5 U	26.6 U	27.2 U	26.6 U	25 U	29.1 U	29.8 U	26.9 U	27.8 U	62.5 U	27.5 U	26 U	NA	NA
4-Bromophenyl phenyl ether	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
4-Chloro-3-methylphenol	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
4-Chloroaniline	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	21.5 U	5.56 U	12.5 U	5.49 U	20.8 U	NA	NA
4-Chlorophenyl phenyl ether	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
4-Nitroaniline	25 U	26.6 U	28.7 U	25.5 U	26 U	258 U	31.3 U	25.5 U	26.6 U	27.2 U	26.6 U	25 U	29.1 U	29.8 U	26.9 U	27.8 U	62.5 U	27.5 U	26 U	NA	NA
4-Nitrophenol	25 U	26.6 U	28.7 U	25.5 U	26 U	258 U	31.3 U	25.5 U	26.6 U	27.2 U	26.6 U	25 U	29.1 U	29.8 U	26.9 U	27.8 U	62.5 U	27.5 U	26 U	NA	NA
Acenaphthene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Acenaphthylene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Anthracene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Benzo(a)anthracene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Benzo(a)pyrene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Benzo(b)fluoranthene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Benzo (g,h,i) perylene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Benzo(k)fluoranthene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	58.9	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Bis(2-chloroethoxy)methane	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 UL	12.5 U	5.49 U	5.21 U	NA	NA
Bis(2-chloroethyl)ether	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Bis(2-chloroisopropyl)ether	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Bis(2-ethylhexyl)phthalate	12.3	5.32 U	8.87	7.2	5.21 U	51.5 U	6.25 U	5.1 U	6.37	5.43 U	21.3	5 U	17.3	6.86	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Butylbenzylphthalate	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Carbazole	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	21.5 U	22.2 U	50 U	22 U	20.8 U	NA	NA
Chrysene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Dibenzo (a,h) anthracene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Dibenzofuran	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Diethyl phthalate	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Dimethyl phthalate	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Di-n-butylphthalate	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Di-n-octylphthalate	7.01	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Fluoranthene	5 U	6.58	5.75 U	5.1 U	5.21 U	76.1	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Fluorene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Hexachlorobenzene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Hexachlorobutadiene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Hexachlorocyclopentadiene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Hexachloroethane	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Indeno(1,2,3-cd)pyrene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Isophorone	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Naphthalene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Nitrobenzene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
n-Nitroso-di-n-propylamine	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
n-Nitrosodiphenylamine	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Pentachlorophenol	25 U	26.6 U	28.7 U	25.5 U	26 U	258 U	31.3 U	25.5 U	26.6 U	27.2 U	26.6 U	25 U	29.1 U	29.8 U	26.9 U	27.8 U	62.5 U	27.5 U	26 U	NA	NA
Phenanthrene	5 U	5.84	5.75 U	5.1 U	5.21 U	55.2	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Phenol	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA

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TABLE 6
Analytical Results for Groundwater Well Samples -
Buildings 82 and 603 Area
Union Carbide Corporation
South Charleston, West Virginia

Sample ID	SCFM-C-01-GW	SCFM-C-02-GW	SCFM-C-03-GW	SCFM-C-04-GW	SCFM-C-05-GW	SCFM-C-06-GW	SCFM-C-07-GW	SCFM-C-08-GW	SCFM-C-09-GW	SCFM-C-10-GW	SCFM-C-11-GW	SCFM-C-12-GW	SCFM-C-13-GW	SCFM-C-14-GW	MW021					MW028D	
Sample Date	05/26/04	05/26/04	05/27/04	05/25/04	05/26/04	05/26/04	05/25/04	05/27/04	05/26/04	05/26/04	05/26/04	05/27/04	05/27/04	05/27/04	10/02/06	04/24/07	10/09/07	04/07/08	10/13/08	02/04/10	10/15/10
Chemical Name																					
Pyrene	5 U	5.32 U	5.75 U	5.1 U	5.21 U	51.5 U	6.25 U	5.1 U	5.32 U	5.43 U	5.32 U	5 U	5.81 U	5.95 U	5.38 U	5.56 U	12.5 U	5.49 U	5.21 U	NA	NA
Dissolved Metals (mg/L)																					
Arsenic	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.024	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	NA	NA	NA	NA	NA	NA	NA
Barium	0.129	0.0842	0.0372	0.0525	0.0559	0.0999	0.0385	0.172	0.14	0.0437	0.0428	0.0375	0.0998	0.0962	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA	NA	NA	NA	NA	NA
Chromium	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0304	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	NA	NA	NA	NA	NA	NA	NA
Lead	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0219	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA	NA	NA	NA	NA	NA
Mercury	2.00E-04 U	2.00E-04 U	2.00E-04 U	2.00E-04 U	2.00E-04 U	2.00E-04 U	2.00E-04 U	2.00E-04 U	2.00E-04 U	2.00E-04 U	2.00E-04 U	2.00E-04 U	2.00E-04 U	2.00E-04 U	NA	NA	NA	NA	NA	NA	NA
Nickel	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.0423	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	NA	NA	NA	NA	NA	NA	NA
Selenium	0.00151	1.00E-03 U	0.00264	1.00E-03 U	0.00235	0.00649	1.00E-03 U	0.00208	0.00138	1.00E-03 U	0.00161	1.00E-03 U	1.00E-03 U	1.00E-03 U	NA	NA	NA	NA	NA	NA	NA
Silver	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed
L - Biased Low
J - Estimated
K - Biased High
R - Rejected
U - Undetected
UL = Undetected and biased low
B = Undetected due to blank contamination

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TABLE 7
Selection of Exposure Pathways
Union Carbide Corporation
South Charleston, West Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface Soil	Surface Soil	Former Building 82 and 603 area	Trespasser	Adult/Child	Incidental ingestion	On-Site	Quant	Although areas at the Site are paved or landscaped and direct contact with soil is not expected, additionally, the entire Site is covered with approximately 1-foot of clean fill material. The trespasser exposure scenario is qualitatively evaluated for completeness.
						Dermal	On-Site	Quant	
	Surface Soil	Air	Volatile and particulates released from surface soil	None	None	None	On-Site	None	Areas at the Site are paved or landscaped. In addition, there are no volatile COPCs associated with surface soil.
	Subsurface Soil	Subsurface Soil	Former Building 82 and 603 area	None	None	None	On-Site	None	Excavation activities are not currently occurring at the former Building 82 and 603 area. Therefore, there is no direct contact with soil.
	Subsurface Soil	Air	Volatiles and particulates released from total soil	None	None	None	On-Site	None	Current excavation activities are not occurring at the former Building 82 and 603 area. Therefore, there is no current exposure to soil.
	Groundwater	Groundwater	Building 82 and Area 603	None	None	None	On-Site	None	Groundwater on or within the vicinity of the Site is not currently being used as a potable source; the Site is supplied with water from the city. Therefore, there is no direct contact with groundwater.
	Groundwater	Air	Volatiles released from groundwater at Building 82 and 603	Industrial Worker	Adult	Inhalation	On-Site	None	No buildings are present on-Site. Therefore, this pathway does not currently exist.
				Construction Worker	Adult	Inhalation	On-Site	None	Excavation activities are not currently occurring at the former Building 82 and 603 area.
Future	Surface Soil	Surface Soil	Former Building 82 and 603 area	Industrial Worker	Adult	Incidental ingestion	On-Site	Quant	If excavation or redevelopment activities were to occur, future receptor populations could contact mixed surface soil at the Site and be exposed to COPCs via incidental ingestion or dermal absorption. However, the Site will most likely be covered by paved areas, buildings, or landscaping.
						Dermal	On-Site	Quant	
				Construction Worker	Adult	Incidental ingestion	On-Site	Quant	
						Dermal	On-Site	Quant	
				Resident	Adult/Child	Incidental ingestion	On-Site	Quant	
						Dermal	On-Site	Quant	
				Trespasser	Adult/Child	Incidental ingestion	On-Site	Quant	
						Dermal	On-Site	Quant	

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TABLE 7
Selection of Exposure Pathways
Union Carbide Corporation
South Charleston, West Virginia

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future (con't)	Surface Soil	Air	Volatile and particulates released from surface soil	Industrial Worker	Adult	Inhalation	On-Site	Quant	
				Construction Worker	Adult	Inhalation	On-Site	Quant	If excavation or redevelopment activities were to occur, future receptor populations could contact mixed surface soil at the Ste and be exposed to COPCs via inhalation of volatiles or particulates. However, the Site will most likely be covered by paved areas, buildings, or landscaping.
				Resident	Adult/Child	Inhalation	On-Site	Quant	
				Trespasser	Adult/Child	Inhalation	On-Site	Quant	
	Subsurface Soil	Subsurface Soil	Former Building 82 and 603 area	Industrial Worker	Adult	Incidental ingestion	On-Site	None	On-Site workers would not be expected to contact subsurface soil at the Site as it would most likely be covered by paved area, building, or landscaping.
						Dermal	On-Site	None	
				Construction Worker	Adult	Incidental ingestion	On-Site	Quant	If construction/excavation activities occur (e.g., installation of utilities), construction workers could contact subsurface soil at the Site and be exposed to COPCs via incidental ingestion.
						Dermal	On-Site	Quant	
				Resident	Adult/Child	Incidental ingestion	On-Site	None	Residents would not be expected to contact subsurface soil at the Site as it would most likely be covered by structures, paved areas, and landscaping.
						Dermal	On-Site	None	
				Trespasser	Adult/Child	Incidental ingestion	On-Site	None	Trespasser would not be expected to contact subsurface soil at the Site as it would most likely be covered by structures, paved areas, and landscaping.
						Dermal	On-Site	None	
		Air	Volatile and particulates released from surface soil	Industrial Worker	Adult	Inhalation	On-Site	None	The Site would most likely be covered by paved areas, buildings, or landscaping.
				Construction Worker	Adult	Inhalation	On-Site	Quant	Construction workers could be exposed to COPCs on particulates released from subsurface soil at the former Building 82 and 603 area.
				Resident	Adult/Child	Inhalation	On-Site	None	The Site would most likely be covered by structures, paved areas, and landscaping
				Trespasser	Adult/Child	Inhalation	On-Site	None	The Site would most likely be covered by structures, paved areas, and landscaping
Future (con't)	Groundwater	Groundwater	Former Building 82 and 603 area	Industrial Worker	Adult	Incidental ingestion	On-Site	None	Groundwater on and within the vicinity of the Site is not used as potable water. It is anticipated that the Site will continue to receive its water supply from the city.
						Dermal	On-Site	None	Groundwater on and within the vicinity of the Site is not used as potable water. It is anticipated that the Site will continue to receive its water supply from the city.
				Construction Worker	Adult	Incidental ingestion	On-Site	None	Due to the average depth of groundwater (i.e., 28 ft), construction workers are not expected to encounter groundwater during excavation/construction activities.
						Dermal	On-Site	None	Due to the average depth of groundwater (i.e., 28 ft), construction workers are not expected to encounter groundwater during excavation/construction activities.
				Resident	Adult/Child	Ingestion	On-Site	None	Groundwater on and within the vicinity of the Site is not used as potable water. It is anticipated that the Site will continue to receive its water supply from the city.
						Dermal	On-Site	None	Groundwater on and within the vicinity of the Site is not used as potable water. It is anticipated that the Site will continue to receive its water supply from the city.
		Air	Indoor Vapors	Industrial Worker	Adult	Inhalation	On-Site	Quant	Volatiles in groundwater could potentially migrate into buildings via vapor intrusion.
			Outdoor Vapors	Construction Worker	Adult	Inhalation	On-Site	Quant	Construction workers may be exposed to vapors during excavation activities.
			Indoor Vapors	Resident	Adult/Child	Inhalation	On-Site	Quant	Volatiles in groundwater could potentially migrate into buildings via vapor intrusion.
			Volatiles at Showerhead	Resident	Adult/Child	Inhalation	On-Site	None	Groundwater on and within the vicinity of the Site is not used as potable water. It is anticipated that the Site will continue to receive its water supply from the city.

Notes:
Quant = quantitative analysis presented

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TABLE 8
Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Current Surface Soil Exposure
Union Carbide Corporation, A Subsidiary of The Dow Chemical Company
South Charleston, West Virginia

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil*

CAS Number	Chemical[a]	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Criteria - Residential RSL (n/c) (3)		Screening Criteria - Trespasser Scenario (n/c) (4)		Maximum Detection Exceeds Criteria?	COPC?	COPC Exclusion Logic
120-12-7	Anthracene	3.34	3.34	µg/kg	SS-15	1/6	3.14 - 202	6.53E+03	N/A	1.70E+06	n	1.14E+07	n		No	Max Concentration < Residential RSL
7440-38-2	Arsenic	6.34	6.34	mg/kg	SS-12	1/1	N/A	6.34E+00	8.64	3.90E-01	c	2.63E+00	c	>Res >Tres	No	Max Concentration < Background
7440-39-3	Barium	422	422	mg/kg	SS-12	1/1	N/A	4.22E+02	360	1.50E+03	n	1.01E+04	n		No	
56-55-3	Benzo (a) anthracene	23.1	23.1	µg/kg	SS-15	1/6	2.66 - 3.14	2.31E+01	N/A	1.50E+02	c	1.01E+03	c		No	
50-32-8	Benzo (a) pyrene	25.4	25.4	µg/kg	SS-15	1/6	2.66 - 3.14	2.54E+01	N/A	1.50E+01	c	1.01E+02	c	>Res	Yes	
205-99-2	Benzo (b) fluoranthene	25.2	25.2	µg/kg	SS-15	1/6	2.66 - 3.14	2.52E+01	N/A	1.50E+02	c	1.01E+03	c		No	
191-24-2	Benzo (g,h,i) perylene	20.5	20.5	µg/kg	SS-15	1/6	2.66 - 3.14	2.05E+01	N/A	1.70E+05	n	1.14E+06	n		No	Max Concentration < Residential RSL
207-08-9	Benzo(k)fluoranthene	27.2	27.2	µg/kg	SS-15	1/6	2.66 - 3.14	2.72E+01	N/A	1.50E+03	c	1.01E+04	c		No	
7440-47-3	Chromium	16.6	16.6	mg/kg	SS-12	1/1	N/A	1.66E+01	46	2.90E-01	c	1.95E+00	c	>Res >Tres	No	Max Concentration < Background
218-01-9	Chrysene	3.0	25.5	µg/kg	SS-15	2/6	2.66 - 3.14	2.55E+01	N/A	1.50E+04	c	1.01E+05	c		No	
53-70-3	Dibenzo (a,h) anthracene	6.82	6.82	µg/kg	SS-15	1/6	2.66 - 3.14	6.82E+00	N/A	1.50E+01	c	1.01E+02	c		No	
206-44-0	Fluoranthene	5.7	43.3	µg/kg	SS-15	4/6	2.66 - 3.14	4.33E+01	N/A	2.30E+05	n	1.55E+06	n		No	Max Concentration < Residential RSL
193-39-5	Indeno (1,2,3-c,d) pyrene	18.8	18.8	µg/kg	SS-15	1/6	2.66 - 3.14	1.88E+01	N/A	1.50E+02	c	1.01E+03	c		No	
7439-92-1	Lead	40.1	40.1	mg/kg	SS-12	1/1	N/A	4.01E+01	16.5	4.00E+02	N/A	2.69E+03	N/A		No	Max Concentration < Residential RSL
7440-02-0	Nickel	17.6	17.6	mg/kg	SS-12	1/1	N/A	1.76E+01	23	1.50E+02	n	1.01E+03	n		No	Max Concentration < Residential RSL
85-01-8	Phenanthrene	5.49	11.0	µg/kg	SS-15	2/6	2.66 - 3.14	1.10E+01	N/A	1.70E+06	n	1.14E+07	n		No	Max Concentration < Residential RSL
129-00-0	Pyrene	3.35	31.9	µg/kg	SS-15	4/6	2.66 - 3.14	3.19E+01	N/A	1.70E+05	n	1.14E+06	n		No	Max Concentration < Residential RSL

(1) Maximum surface soil* concentration used for screening.
(2) Mean natural background values from West Virginia Department of Environmental Protection (2002).
(3) Screening levels based on USEPA Regional Screening Levels (June 2011) an excess lifetime cancer risk of 1 x 10^{6} and a hazard quotient of 0.1.
(4) Screening levels for a trespasser scenario are based on residential RSLs (as detailed in this table), and adjusted for an exposure frequency of 52 days/year.
*Surface soil data included for current exposure scenarios: SS-03 and SS-12 through SS-16 at 0 to 1 feet below ground surface

[a]Analytes with surrogate screening levels applied include:
Acenaphthylene; acenaphthene was used as a surrogate.
Benzo (g,h,i) perylene; pyrene was used as a surrogate.
Phenanthrene; anthracene was used as a surrogate.
Chromium; hexavalent chromium was used as a surrogate.

K - High biased result
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

RSL = Regional Screening Level
N/A = Not Applicable or Not Available
COPC = Chemical of Potential Concern
c = Carcinogenic
n = Non-Carcinogenic
>Res = maximum detected concentration is higher than the Residential RSL for soil
>Tres = maximum detected concentration is higher than the Trespasser screening level for soil
>Ind = maximum detected concentration is higher than the Industrial RSL for soil

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TABLE 9
Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Future Surface Soil Exposure
Union Carbide Corporation, A Subsidiary of The Dow Chemical Company
South Charleston, West Virginia

Scenario Timeframe: Future

Medium: Surface Soil

Exposure Medium: Surface Soil*

CAS Number	Chemical[a]	Minimum Detected Concentration		Maximum Detected Concentration		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Criteria - Residential RSL (n/c) (3)		Screening Criteria - Trespasser Scenario (n/c) (4)		Screening Criteria - Industrial RSL (n/c) (3)		Maximum Detection Exceeds Criteria?	COPC?	COPC Exclusion Logic
90-12-0	1-Methylnaphthalene	7.42		111		µg/kg	SS-02	5/11	2.72 - 3.25	1.11E+02	N/A	2.20E+04	c	1.48E+05	c	9.90E+04	c		No	Max Concentration < Residential RSL
91-57-6	2-Methylnaphthalene	8.65		153		µg/kg	SS-02	5/15	2.72 - 202	1.53E+02	N/A	3.10E+04	n	2.09E+05	n	4.10E+05	n		No	Max Concentration < Residential RSL
83-32-9	Acenaphthene	11		156	K	µg/kg	SS-02	2/15	2.72 - 202	1.56E+02	N/A	3.40E+05	n	2.29E+06	n	3.30E+06	n		No	Max Concentration < Residential RSL
208-96-8	Acenaphthylene	6.95		48	K	µg/kg	SS-02	4/15	2.72 - 202	4.79E+01	N/A	3.40E+05	n	2.29E+06	n	3.30E+06	n		No	Max Concentration < Residential RSL
120-12-7	Anthracene	2.86		681		µg/kg	SS-02	6/15	3.14 - 202	6.81E+02	N/A	1.70E+06	n	1.14E+07	n	1.70E+07	n		No	Max Concentration < Residential RSL
11096-82-5	Aroclor-1260	56.3		56.3		µg/kg	SS-02	1/15	18.2 - 22.5	5.63E+01	N/A	2.20E+02	c	1.48E+03	c	7.40E+02	c		No	
7440-38-2	Arsenic	1.54		8.7		mg/kg	SS-04	13/15	1.77 - 1.81	8.70E+00	8.64	3.90E-01	c	2.63E+00	c	1.60E+00	c	>Res >Tres >Ind	No	Max Concentration Within Range of Background
7440-39-3	Barium	22.7		2,100		mg/kg	SS-01	14/15	N/A	2.10E+03	360	1.50E+03	n	1.01E+04	n	1.90E+04	n	>Res	Yes	
71-43-2	Benzene	19.3		19		µg/kg	SS-07	14/15	4.48 - 6.26	1.93E+01	N/A	1.10E+03	c	7.40E+03	c	5.40E+03	c		No	Max Concentration < Residential RSL
56-55-3	Benzo (a) anthracene	3.46		2,180		µg/kg	SS-02	8/15	3.14 - 202	2.18E+03	N/A	1.50E+02	c	1.01E+03	c	2.10E+03	c	>Res >Tres >Ind	Yes	
50-32-8	Benzo (a) pyrene	4.46		1,970		µg/kg	SS-02	7/15	3.14 - 202	1.97E+03	N/A	1.50E+01	c	1.01E+02	c	2.10E+02	c	>Res >Tres >Ind	Yes	
205-99-2	Benzo (b) fluoranthene	4.52		1,820		µg/kg	SS-02	8/15	3.14 - 202	1.82E+03	N/A	1.50E+02	c	1.01E+03	c	2.10E+03	c	>Res >Tres	Yes	
191-24-2	Benzo (g,h,i) perylene	4.62		1,300		µg/kg	SS-02	7/15	3.14 - 202	1.30E+03	N/A	1.70E+05	n	1.14E+06	n	1.70E+06	n		No	Max Concentration < Residential RSL
207-08-9	Benzo(k)fluoranthene	4.52		1,660		µg/kg	SS-02	7/15	3.14 - 202	1.66E+03	N/A	1.50E+03	c	1.01E+04	c	2.10E+04	c	>Res	Yes	
117-81-7	Bis (2-ethylhexyl) phthalate	623		623		µg/kg	SCFM-C-05	1/15	188 - 2020	6.23E+02	N/A	3.50E+04	c	2.36E+05	c	1.20E+05	c		No	Max Concentration < Residential RSL
7440-47-3	Chromium	6.62		22		mg/kg	SCFM-C-01	15/15	N/A	2.22E+01	46	2.90E-01	c	1.95E+00	c	5.60E+00	c	>Res >Tres >Ind	No	Max Concentration < Background
218-01-9	Chrysene	5.81		2,030		µg/kg	SS-02	8/15	3.14 - 202	2.03E+03	N/A	1.50E+04	c	1.01E+05	c	2.10E+05	c		No	
53-70-3	Dibenzo (a,h) anthracene	10.4		391		µg/kg	SS-02	4/15	2.72 - 202	3.91E+02	N/A	1.50E+01	c	1.01E+02	c	2.10E+02	c	>Res >Tres >Ind	Yes	
206-44-0	Fluoranthene	3.44		4,480		µg/kg	SS-02	9/15	3.14 - 202	4.48E+03	N/A	2.30E+05	n	1.55E+06	n	2.20E+06	n		No	Max Concentration < Residential RSL
86-73-7	Fluorene	8.67		155	K	µg/kg	SS-02	2/15	2.72 - 202	1.55E+02	N/A	2.30E+05	n	1.55E+06	n	2.20E+06	n		No	Max Concentration < Residential RSL
193-39-5	Indeno (1,2,3-c,d) pyrene	3.59		1,210		µg/kg	SS-02	7/15	3.14 - 202	1.21E+03	N/A	1.50E+02	c	1.01E+03	c	2.10E+03	c	>Res >Tres	Yes	
7439-92-1	Lead	5.79		42.6		mg/kg	SS-05	15/15	N/A	4.26E+01	16.5	4.00E+02	N/A	2.69E+03	N/A	8.00E+02	N/A		No	Max Concentration < Residential RSL
7439-97-6	Mercury	2.2		2.2		mg/kg	SS-07	1/15	0.262 - 0.313	2.22E+00	N/A	1.00E+00	n	6.73E+00	n	4.30E+00	n	>Res	Yes	
91-20-3	Naphthalene	3.59		137	K	µg/kg	SS-02	6/15	2.72 - 202	1.37E+02	N/A	3.60E+03	c	2.42E+04	c	1.80E+04	c		No	Max Concentration < Residential RSL
7440-02-0	Nickel	6.94		30		mg/kg	SS-04	15/15	N/A	3.00E+01	23	1.50E+02	n	1.01E+03	n	2.00E+03	n		No	Max Concentration < Residential RSL
85-01-8	Phenanthrene	4.19		2,120		µg/kg	SS-02	9/15	3.14 - 202	2.12E+03	N/A	1.70E+06	n	1.14E+07	n	1.70E+07	n		No	Max Concentration < Residential RSL
129-00-0	Pyrene	5.19		3,580		µg/kg	SS-02	8/15	3.14 - 202	3.58E+03	N/A	1.70E+05	n	1.14E+06	n	1.70E+06	n		No	Max Concentration < Residential RSL
7782-49-2	Selenium	0.118		0.2		mg/kg	SCFM-C-01	3/15	1.05 - 1.21	1.87E-01	0.465	3.90E+01	n	2.63E+02	n	5.10E+02	n		No	Max Concentration < Background
127-18-4	Tetrachloroethene	8.27		8.3		µg/kg	SS-02	1/20	4.48 - 6.26	8.27E+00	N/A	5.50E+02	c	3.70E+03	c	2.60E+03	c		No	Max Concentration < Residential RSL
108-88-3	Toluene	6.4		6		µg/kg	SS-11	1/15	4.93 - 6.4	6.40E+00	N/A	5.00E+05	n	3.37E+06	n	4.50E+06	n		No	Max Concentration < Residential RSL
75-01-4	Vinyl chloride	16.6	K	17	K	µg/kg	SS-07	1/22	8.97 - 12.5	1.66E+01	N/A	6.00E+01	c	4.04E+02	c	1.70E+03	c		No	Max Concentration < Residential RSL

(1) Maximum surface soil* concentration used for screening.
(2) Mean natural background values from West Virginia Department of Environmental Protection (2002).
(3) Screening levels based on USEPA Regional Screening Levels (June 2011) an excess lifetime cancer risk of 1 x 10^{-6} and a hazard quotient of 0.1.
(4) Screening levels for a trespasser scenario are based on residential RSLs (as detailed in this table), and adjusted for an exposure frequency of 52 days/year.
*Surface soil locations included for future exposure scenarios: SS-01 through SS-12, SCFM-C-01, SCFM-C-04, SCFM-C-05, and SCFM-C-07.

RSL = Regional Screening Level
N/A = Not Applicable or Not Available
COPC = Chemical of Potential Concern
c = Carcinogenic
n = Non-Carcinogenic
>Res = maximum detected concentration is higher than the Residential RSL for soil
>Tres = maximum detected concentration is higher than the Trespasser screening level for soil
>Ind = maximum detected concentration is higher than the Industrial RSL for soil

[a]Analytes with surrogate screening levels applied include:
Acenaphthylene; acenaphthene was used as a surrogate.
Benzo (g,h,i) perylene; pyrene was used as a surrogate.
Phenanthrene; anthracene was used as a surrogate.
Chromium; hexavalent chromium was used as a surrogate.

K - High biased result
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

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TABLE 10
Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Future Total Soil Exposure
Union Carbide Corporation, A Subsidiary of The Dow Chemical Company
South Charleston, West Virginia

Scenario Timeframe: Future
Medium: Total Soil
Exposure Medium: Total Soil

CAS Number	Chemical[a]	Minimum Detected Concentration		Maximum Detected Concentration		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Criteria - Industrial RSL (n/c) (3)		Maximum Detection Exceeds Criteria?	COPC?	COPC Exclusion Logic
90-12-0	1-Methylnaphthalene	7.4		111		µg/kg	SS-02	5/12	2.72 - 3.25	1.11E+02	N/A	9.90E+04	c		No	Max Concentration < Industrial RSL
91-57-6	2-Methylnaphthalene	8.7		153		µg/kg	SS-02	5/32	2.72 - 1040	1.53E+02	N/A	4.10E+05	n		No	Max Concentration < Industrial RSL
78-93-3	2-Butanone	5.8	J	8	J	µg/kg	SB-7	2/25	11.3 - 29.9	7.60E+00	N/A	2.00E+07	n		No	Max Concentration < Industrial RSL
83-32-9	Acenaphthene	11		156	K	µg/kg	SS-02	2/32	2.72 - 1040	1.56E+02	N/A	3.30E+06	n		No	Max Concentration < Industrial RSL
208-96-8	Acenaphthylene	7.0		48	K	µg/kg	SS-02	4/32	2.72 - 1040	4.79E+01	N/A	3.30E+06	n		No	Max Concentration < Industrial RSL
67-64-1	Acetone	19		43	J	µg/kg	SCFM-C-03	6/32	11.3 - 120	4.32E+01	N/A	6.30E+07	n		No	Max Concentration < Industrial RSL
120-12-7	Anthracene	2.9		681		µg/kg	SS-02	8/32	3.14 - 1040	6.81E+02	N/A	1.70E+07	n		No	Max Concentration < Industrial RSL
11096-82-5	Aroclor-1260	56		56		µg/kg	SS-02	3/32	18.2 - 22.5	5.63E+01	N/A	7.40E+02	c		No	Max Concentration < Industrial RSL
7440-38-2	Arsenic	1.5		8.7		mg/kg	SS-04	30/32	1.77 - 1.81	8.70E+00	8.64E+00	1.60E+00	c	>Ind	No	Max Concentration Within Range of Background
7440-39-3	Barium	23		2,100		mg/kg	SS-01	32/32	0.38 - 0.452	2.10E+03	3.60E+02	1.90E+04	n		No	Max Concentration < Industrial RSL
71-43-2	Benzene	19		19		µg/kg	SS-07	1/32	4.48 - 6.39	1.93E+01	N/A	5.40E+03	c		No	Max Concentration < Industrial RSL
56-55-3	Benzo (a) anthracene	3.5		2,180		µg/kg	SS-02	12/32	3.14 - 1040	2.18E+03	N/A	2.10E+03	c	>Ind	Yes	
50-32-8	Benzo (a) pyrene	4.5		1,970		µg/kg	SS-02	11/32	3.14 - 1040	1.97E+03	N/A	2.10E+02	c	>Ind	Yes	
205-99-2	Benzo (b) fluoranthene	4.5		1,820		µg/kg	SS-02	12/32	3.14 - 1040	1.82E+03	N/A	2.10E+03	c		No	
191-24-2	Benzo (g,h,i) perylene	4.6		1,300		µg/kg	SS-02	10/32	3.14 - 1040	1.30E+03	N/A	1.70E+06	n		No	Max Concentration < Industrial RSL
207-08-9	Benzo(k)fluoranthene	4.5		1,660		µg/kg	SS-02	11/32	3.14 - 1040	1.66E+03	N/A	2.10E+04	c		No	Max Concentration < Industrial RSL
117-81-7	Bis (2-ethylhexyl) phthalate	499		623		µg/kg	SB-13	3/32	188 - 2020	6.23E+02	N/A	1.20E+05	c		No	Max Concentration < Industrial RSL
7440-43-9	Cadmium	0.182	J	2.5		mg/kg	SCFM-C-03	2/32	0.383 - 0.633	2.50E+00	N/A	8.00E+01	n		No	Max Concentration < Industrial RSL
75-15-0	Carbon Disulfide	1.7	J	1.7	J	µg/kg	SB-6	1/32	4.48 - 6.39	1.65E+00	N/A	3.70E+05	n		No	Max Concentration < Industrial RSL
67-66-3	Chloroform	4.0	J	4.0	J	µg/kg	SB-5	1/32	4.48 - 6.39	4.00E+00	N/A	1.50E+03	c		No	Max Concentration < Industrial RSL
7440-47-3	Chromium	6.6		33		mg/kg	SB-2	32/32	0.759 - 0.905	3.30E+01	4.60E+01	5.60E+00	c	>Ind	No	Max Concentration < Background
218-01-9	Chrysene	5.8		2,030		µg/kg	SS-02	12/32	3.14 - 1040	2.03E+03	N/A	2.10E+05	c		No	Max Concentration < Industrial RSL
156-59-2	cis-1,2-Dichloroethene	10.0		10.0		µg/kg	SB-5	1/24	4.48 - 6.39	1.00E+01	N/A	2.00E+05	n		No	Max Concentration < Industrial RSL
53-70-3	Dibenzo (a,h) anthracene	10.4		391		µg/kg	SS-02	4/32	2.72 - 1040	3.91E+02	N/A	2.10E+02	c	>Ind	Yes	
141-78-6	Ethyl acetate	71.8		71.8		µg/kg	SB-7	1/13	59 - 65	7.18E+01	N/A	9.20E+07	n		No	Max Concentration < Industrial RSL
206-44-0	Fluoranthene	3.44		4,480		µg/kg	SS-02	13/32	3.14 - 1040	4.48E+03	N/A	2.20E+06	n		No	Max Concentration < Industrial RSL
86-73-7	Fluorene	8.67		155	K	µg/kg	SS-02	2/32	2.72 - 1040	1.55E+02	N/A	2.20E+06	n		No	Max Concentration < Industrial RSL
87-68-3	Hexachlorobutadiene	1.7	J	1.7	J	µg/kg	SB-5	1/32	5.9 - 2020	1.65E+00	N/A	2.20E+04	c		No	Max Concentration < Industrial RSL
193-39-5	Indeno (1,2,3-c,d) pyrene	3.59		1,210		µg/kg	SS-02	10/32	3.14 - 1040	1.21E+03	N/A	2.10E+03	c		No	
7439-92-1	Lead	5.79		490		mg/kg	SCFM-C-03	32/32	N/A	4.90E+02	1.65E+01	8.00E+02	N/A		No	Max Concentration < Industrial RSL
7439-97-6	Mercury	0.0232	J	2		mg/kg	SS-07	12/32	0.262 - 0.32	2.22E+00	1.40E-01	4.30E+00	n		No	Max Concentration < Industrial RSL
91-20-3	Naphthalene	3.59		137	K	µg/kg	SS-02	6/32	2.72 - 1040	1.37E+02	N/A	1.80E+04	c		No	Max Concentration < Industrial RSL
7440-02-0	Nickel	6.94		30		mg/kg	SS-04	19/19	N/A	3.00E+01	2.30E+01	2.00E+03	n		No	Max Concentration < Industrial RSL
85-01-8	Phenanthrene	4.19		2,120		µg/kg	SS-02	13/32	3.14 - 1040	2.12E+03	N/A	1.70E+07	n		No	Max Concentration < Industrial RSL
129-00-0	Pyrene	5.19		3,580		µg/kg	SS-02	14/32	3.14 - 1040	3.58E+03	N/A	1.70E+06	n		No	Max Concentration < Industrial RSL
7782-49-2	Selenium	0.118		1		mg/kg	SCFM-C-06	21/32	1.05 - 1.21	5.91E-01	4.65E-01	5.10E+02	n		No	Max Concentration < Industrial RSL
127-18-4	Tetrachloroethene	8.27		245		µg/kg	SB-5	2/32	4.48 - 6.39	2.45E+02	N/A	2.60E+03	n		No	Max Concentration < Industrial RSL
108-88-3	Toluene	0.872	J	6		µg/kg	SS-11	3/32	4.48 - 6.4	6.40E+00	N/A	4.50E+06	n		No	Max Concentration < Industrial RSL
79-01-6	Trichloroethene	12		12		µg/kg	SB-5	1/32	4.48 - 6.39	1.16E+01	N/A	1.40E+04	c		No	Max Concentration < Industrial RSL
75-01-4	Vinyl chloride	17	K	17	K	µg/kg	SS-07	1/32	8.97 - 12.8	1.66E+01	N/A	1.70E+03	c		No	Max Concentration < Industrial RSL
1330-20-7	Xylenes, Total	29		29		µg/kg	SCFM-C-03	1/32	5.64 - 12	2.89E+01	N/A	2.70E+05	n		No	Max Concentration < Industrial RSL

(1) Maximum concentration used for screening.
(2) Mean natural background values from West Virginia Department of Environmental Protection (2002).
(3) Screening levels based on USEPA Regional Screening Levels (June 2011) an excess lifetime cancer risk of 1 x 10^{-6} and a hazard quotient of 0.1.

[a]Analytes with surrogate screening levels applied include:
Acenaphthylene; acenaphthene was used as a surrogate.
Benzo (g,h,i) perylene; pyrene was used as a surrogate.
Phenanthrene; anthracene was used as a surrogate.
Chromium; hexavalent chromium was used as a surrogate.

J - Estimated Value
K - High biased result
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

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TABLE 11
Occurrence, Distribution and Selection of Chemicals of
Potential Concern - Future Groundwater Exposure
Union Carbide Corporation
South Charleston, West Virginia

Scenario Timeframe: Future

Medium: Groundwater

Exposure Medium: Groundwater

CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value	Screening Criteria - Tap Water RSL (n/c) (2)		Maximum Contaminant Level	Screening Level Comparison
67641	Acetone	1.18E+01	1.18E+01	µg/L	SCFM-PZ039	1/31	1.0E+01 - 1.0E+01	1.18E+01	N/A	2.20E+03	n	N/A	
71432	Benzene	6.62E+00	7.54E+00	µg/L	SCFM-C-08-GW	2/31	5.0E+00 - 5.0E+00	7.54E+00	N/A	4.10E-01	c	5.00E+00	>Tap >MCL
56235	Carbon tetrachloride	7.36E+00	7.97E+01	µg/L	SCFM-PZ041	13/31	5.0E+00 - 5.0E+00	7.97E+01	N/A	4.40E-01	c	5.00E+00	>Tap >MCL
67663	Chloroform	5.74E+00	2.15E+01	µg/L	SCFM-C-08-GW	12/31	5.0E+00 - 5.0E+00	2.15E+01	N/A	1.90E-01	c	N/A	>Tap
127184	Tetrachloroethene	2.56E+00	2.57E+00	µg/L	SCFM-PZ039	2/31	1.0E+00 - 5.0E+00	2.57E+00	N/A	1.10E-01	c	5.00E+00	>Tap
79016	Trichloroethene	1.22E+00	1.64E+00	µg/L	SCFM-PZ039	2/31	1.0E+00 - 5.0E+00	1.64E+00	N/A	2.00E+00	c	5.00E+00	
75014	Vinyl chloride	1.83E+01	1.83E+01	µg/L	SCFM-C-13-GW	1/31	1.0E+01 - 1.0E+01	1.83E+01	N/A	1.60E-02	c	2.00E+00	>Tap >MCL
1330207	Xylenes	8.03E+00	8.03E+00	µg/L	SCFM-PZ039	1/31	5.0E+00 - 5.0E+00	8.03E+00	N/A	2.00E+01	n	1.00E+04	
207089	Benzo[k]fluoranthene	5.89E+01	5.89E+01	µg/L	SCFM-C-06-GW	1/25	5.0E+00 - 6.25E+00	5.89E+01	N/A	2.90E-01	c	N/A	>Tap
117817	Bis(2-ethylhexyl)phthalate	6.37E+00	2.13E+01	µg/L	SCFM-C-11-GW	8/24	5.0E+00 - 5.15E+01	2.13E+01	N/A	4.80E+00	c	6.00E+00	>Tap >MCL
117840	Di-n-octyl phthalate[a]	7.01E+00	8.95E+00	µg/L	SCFM-PZ040	2/25	5.0E+00 - 5.15E+01	8.95E+00	N/A	2.90E+03	n	N/A	
206440	Fluoranthene	6.58E+00	7.61E+01	µg/L	SCFM-C-06-GW	2/25	5.0E+00 - 6.25E+00	7.61E+01	N/A	1.50E+02	n	N/A	
85018	Phenanthrene[b]	5.84E+00	5.52E+01	µg/L	SCFM-C-06-GW	2/25	5.0E+00 - 6.25E+00	5.52E+01	N/A	1.10E+03	n	N/A	
108952	Phenol	1.80E+02	1.80E+02	µg/L	SCFM-PZ039	1/25	5.0E+00 - 5.15E+01	1.80E+02	N/A	1.10E+03	n	N/A	
7440382	Total Arsenic	4.28E+00 L	4.28E+00 L	µg/L	SCFM-PZ039	1/4	4.0E+00 - 4.0E+00	4.28E+00	N/A	4.50E-02	c	1.00E+01	>Tap
7440393	Total Barium	6.35E+01	7.93E+02 K	µg/L	SCFM-PZ039	4/4	N/A	7.93E+02	N/A	7.30E+02	n	2.00E+03	>Tap
7440473	Total Chromium	4.32E+01	6.03E+01	µg/L	SCFM-PZ039	3/4	2.0E+01 - 2.0E+01	6.03E+01	N/A			1.00E+02	
7439921	Total Lead	8.26E+00	8.26E+00	µg/L	SCFM-PZ039	1/4	5.0E+00 - 5.0E+00	8.26E+00	N/A			1.50E+01	
7440020	Total Nickel	5.01E+01	5.01E+01	µg/L	SCFM-PZ041	1/4	4.0E+01 - 4.0E+01	5.01E+01	N/A	7.30E+01	n		
7782492	Total Selenium	1.10E+00	5.97E+00	µg/L	SCFM-PZ041	4/4	N/A	6.49E+00	N/A	1.80E+01	n	5.00E+01	
7440382	Dissolved Arsenic	2.40E+01	2.40E+01	µg/L	SCFM-C-08-GW	1/16	4.0E+00 - 4.0E+00	2.40E+01	N/A	4.50E-02	c	1.00E+01	>Tap >MCL
7440393	Dissolved Barium	3.72E+01	1.72E+02	µg/L	SCFM-C-08-GW	16/16	N/A	1.72E+02	N/A	7.30E+02	n	2.00E+03	
7440473	Dissolved Chromium	3.04E+01	3.04E+01	µg/L	SCFM-C-08-GW	1/16	1.0E+01 - 2.0E+01	3.04E+01	N/A			1.00E+02	
7439921	Dissolved Lead	2.19E+01	2.19E+01	µg/L	SCFM-C-08-GW	1/16	5.0E+00 - 5.0E+00	2.19E+01	N/A			1.50E+01	
7440020	Dissolved Nickel	4.23E+01	4.23E+01	µg/L	SCFM-C-08-GW	1/16	4.0E+01 - 4.0E+01	4.23E+01	N/A	7.30E+01	n		
7782492	Dissolved Selenium	6.83E+00	6.83E+00	µg/L	SCFM-PZ041	8/16	N/A	6.83E+00	N/A	1.80E+01	n	5.00E+01	

(1) Maximum concentration used for screening.

(2) Screening levels based on USEPA Regional Screening Levels (June 2011), an excess lifetime cancer risk of 1 x 10^{-6} and a hazard quotient of 0.1.

[a] Screening levels for diethyl phthalate applied to di-n-octyl phthalate as surrogate values.

[b] Screening levels for anthracene applied to phenanthrene as surrogate values.

RSL = Regional Screening Level
N/A = Not Applicable or Not Available
COPC = Chemical of Potential Concern
MCL = Maximum Contaminant Level
K - High biased result
L - Low biased result
c = Carcinogenic
n = Non-Carcinogenic
µg/L = microgram(s) per liter
>Tap = maximum detected concentration is higher than the Tap Water RSL
>MCL = maximum detected concentration is higher than the MCL

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TABLE 12
Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Future Groundwater Exposure, Vapor Intrusion of Volatile Organic Compounds
Union Carbide Corporation
South Charleston, West Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Indoor Air (Vapor Intrusion)

CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Concentration Used for Screening (1)	Background Value	Screening Criteria - Groundwater RSL Protective of Residential Indoor Air (n/c) (2)		Screening Criteria - Groundwater RSL Protective of Industrial Indoor Air (n/c) (2)		Maximum Detection Exceeds Criteria	COPC?	COPC Exclusion Logic
67641	Acetone	1.18E+01	1.18E+01	µg/L	SCFM-PZ039	1/31	1.18E+01	N/A	2.29E+06	n	9.64E+06	n		No	Max Concentration < Residential RSL
71432	Benzene	6.62E+00	7.54E+00	µg/L	SCFM-C-08-GW	2/31	7.54E+00	N/A	1.35E+01	c	5.70E+01	n		No	Max Concentration < Residential RSL
56235	Carbon tetrachloride	7.36E+00	7.97E+01	µg/L	SCFM-PZ041	13/31	7.97E+01	N/A	3.73E+00	c	1.90E+01	c	>Res >Ind	Yes	
67663	Chloroform	5.74E+00	2.15E+01	µg/L	SCFM-C-08-GW	12/31	2.15E+01	N/A	7.33E+00	c	3.60E+01	c	>Res	Yes	
127184	Tetrachloroethene	2.56E+00	2.57E+00	µg/L	SCFM-PZ039	2/31	2.57E+00	N/A	5.69E+00	c	2.90E+01	c		No	Max Concentration < Residential RSL
79016	Trichloroethene	1.22E+00	1.64E+00	µg/L	SCFM-PZ039	2/31	1.64E+00	N/A	2.50E+00	n	1.10E+01	n		No	Max Concentration < Residential RSL
75014	Vinyl chloride	1.83E+01	1.83E+01	µg/L	SCFM-C-13-GW	1/31	1.83E+01	N/A	1.45E+00	c	2.50E+01	c	>Res	Yes	
1330207	Xylenes	8.03E+00	8.03E+00	µg/L	SCFM-PZ039	1/31	8.03E+00	N/A	4.76E+01	n	2.09E+02	n		No	Max Concentration < Residential RSL

(1) Maximum concentration used for screening.
(2) Screening levels based on USEPA Regional Screening Levels (June 2011), an excess lifetime cancer risk of 1 x 10 $^{-5}$, a hazard quotient of 0.1, and an attenuation factor of 0.001.
RSL = Regional Screening Level
>Res = maximum detected concentration is higher than the generic groundwater screening level for protection of indoor, residential air
>Ind = maximum detected concentration is higher than the generic groundwater screening level for protection of indoor, industrial air
µg/L = micrograms per liter
c = Carcinogenic
COPC = chemical of potential concern
n = Non-Carcinogenic
N/A = not applicable or not Available

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TABLE 13

Upper Confidence Limits and Exposure Point Concentrations - Potential Future Industrial Exposure to Surface Soil

Union Carbide Corporation, A Subsidiary of The Dow Chemical Company

South Charleston, West Virginia

Analyte	Unit	UCL	UCL Basis	EPC	EPC Basis
Aroclor-1260	ug/kg	249	95% KM (BCA) UCL	249	95% KM (BCA) UCL
Barium	mg/kg	787	95% Approximate Gamma UCL	787	95% Approximate Gamma UCL
Benzo (a) anthracene	ug/kg	10,584	99% KM (Chebyshev) UCL	10,584	99% KM (Chebyshev) UCL
Benzo (a) pyrene	ug/kg	2,453	95% KM (t) UCL	2,453	95% KM (t) UCL
Benzo (b) fluoranthene	ug/kg	8,881	99% KM (Chebyshev) UCL	8,881	99% KM (Chebyshev) UCL
Benzo(k)fluoranthene	ug/kg	2,138	95% KM (t) UCL	2,138	95% KM (t) UCL
Chrysene	ug/kg	10,142	99% KM (Chebyshev) UCL	10,142	99% KM (Chebyshev) UCL
Dibenzo (a,h) anthracene	ug/kg	556	95% KM (t) UCL	556	95% KM (t) UCL
Indeno (1,2,3-c,d) pyrene	ug/kg	1,543	95% KM (t) UCL	1,543	95% KM (t) UCL
Mercury	mg/kg	0.97	95% KM (t) UCL	0.97	95% KM (t) UCL

Locations included for potential future industrial exposure to surface soil: SS-01 through SS-12, SCFM-C-01, SCFM-C-04, SCFM-C-05, and SCFM-C-07

ug/kg - micrograms per kilogram

mg/kg - milligrams per kilogram

UCL - upper confidence limit (calculated using ProUCL version 4.00.04 [Appendix B])

EPC - exposure point concentration

KM - Kaplan-Meier

N/A = Not Applicable or Not Available

TABLE 14
Risk Characterization Detail - Current Trespasser Exposure to Surface Soil
Screening Level HHRA for the Area of Former Buildings 82 and 603
UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth, ft bgs	Chemical of Potential Concern	Sample Conc	Units	Cancer RBSL	Cancer Risk	Contribution	Non-Cancer RBSL	Non-Cancer Hazard Quotient	% Contribution
SS-15	5/6/2011	0-1	Benzo (a) pyrene	25	ug/kg	1.0E+02	2.5E-07	63.7	---	---	---
		SS-15 - Soil on 5/6/2011 Total Risk					**3.E-07**				

Notes:

ft bgs	feet below ground surface
ug/kg	micrograms per kilogram
NA	not applicable
---	Toxicity data not available
J	Estimated result
RBSL	Risk-based screening levels are from the USEPA Regional Screening Level table for Residential Soil (June 2011), based on a target risk of 1E-06 and a hazard quotient of 0.1. Screening levels for a trespasser scenario are based on residential soil RSLs adjusted for an exposure frequency of 52 days/year.

TABLE 15
Risk Characterization Detail - Future Residential Exposure to Surface Soi
Screening Level HHRA for the Area of Former Buildings 82 and 603

UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth, ft bgs	Chemical of Potential Concern	Sample Conc	Units	Cancer RBSL	Cancer Risk	Contribution	Non-Cancer RBSL	Non-Cancer Hazard Quotient	% Contribution
SCFM-C-01	5/26/2004	0.5-1.5	Barium	95	mg/kg	---	---	---	1.5E+03	<0.01	100.0
		SCFM-C-01 - Soil on 5/26/2004 Total Risk								**<0.01**	
SCFM-C-04	5/25/2004	1-2	Barium	38	mg/kg	---	---	---	1.5E+03	<0.01	100.0
		SCFM-C-04 - Soil on 5/25/2004 Total Risk								**<0.01**	
SCFM-C-07	5/25/2004	1-2	Barium	23	mg/kg	---	---	---	1.5E+03	<0.01	100.0
		SCFM-C-07 - Soil on 5/25/2004 Total Risk								**<0.01**	
SS-01	9/23/2010	1.5 - 2.5	Barium	2,100	mg/kg	---	---	---	1.5E+03	0.1	100.0
			Benzo (a) anthracene	40	ug/kg	1.5E+02	2.6E-07	6.2	---	---	---
			Benzo (a) pyrene	41	ug/kg	1.5E+01	2.7E-06	63.7	---	---	---
			Benzo (b) fluoranthene	53	ug/kg	1.5E+02	3.5E-07	8.3	---	---	---
			Benzo(k)fluoranthene	37	ug/kg	1.5E+03	2.5E-08	0.6	---	---	---
			Dibenzo (a,h) anthracene	10	ug/kg	1.5E+01	6.9E-07	16.4	---	---	---
			Indeno (1,2,3-c,d) pyrene	30	ug/kg	1.5E+02	2.0E-07	4.7	---	---	---
		SS-02 - Soil on 9/23/2010 Total Risk					**4.E-06**			**0.1**	
SS-02	9/23/2010	0.5 - 1.5	Barium	705	mg/kg	---	---	---	1.5E+03	0.05	100.0
			Benzo (a) anthracene	2,180	ug/kg	1.5E+02	1.5E-05	7.6	---	---	---
			Benzo (a) pyrene	1,970	ug/kg	1.5E+01	1.3E-04	67.8	---	---	---
			Benzo (b) fluoranthene	1,820	ug/kg	1.5E+02	1.2E-05	6.3	---	---	---
			Benzo(k)fluoranthene	1,880	ug/kg	1.5E+03	1.1E-06	0.6	---	---	---
			Dibenzo (a,h) anthracene	391	ug/kg	1.5E+01	2.6E-05	13.6	---	---	---
			Indeno (1,2,3-c,d) pyrene	1,210	ug/kg	1.5E+02	8.1E-06	4.2	---	---	---
		SS-02 - Soil on 9/23/2010 Total Risk					**2.E-04**			**0.05**	
SS-04	9/23/2010	1 - 2	Barium	255	mg/kg	---	---	---	1.5E+03	0.02	100.0
			Benzo (a) anthracene	11	ug/kg	1.5E+02	7.5E-08	7.9	---	---	---
			Benzo (a) pyrene	11	ug/kg	1.5E+01	7.4E-07	78.2	---	---	---
			Benzo (b) fluoranthene	11	ug/kg	1.5E+02	7.5E-08	7.9	---	---	---
			Benzo(k)fluoranthene	11	ug/kg	1.5E+03	7.3E-09	0.8	---	---	---
			Indeno (1,2,3-c,d) pyrene	7	ug/kg	1.5E+02	4.8E-08	5.1	---	---	---
		SS-04 - Soil on 9/23/2010 Total Risk					**9.E-07**			**0.02**	
SS-05	9/23/2010	0.5 - 1.5	Barium	2,020	mg/kg	---	---	---	1.5E+03	0.1	100.0
			Benzo (a) anthracene	53	ug/kg	1.5E+02	3.5E-07	6.5	---	---	---
			Benzo (a) pyrene	54	ug/kg	1.5E+01	3.6E-06	66.6	---	---	---
			Benzo (b) fluoranthene	48	ug/kg	1.5E+02	3.2E-07	6.0	---	---	---
			Benzo(k)fluoranthene	50	ug/kg	1.5E+03	3.3E-08	0.6	---	---	---
			Dibenzo (a,h) anthracene	13	ug/kg	1.5E+01	8.3E-07	15.5	---	---	---
			Indeno (1,2,3-c,d) pyrene	39	ug/kg	1.5E+02	2.6E-07	4.8	---	---	---
		SS-05 - Soil on 9/23/2010 Total Risk					**5.E-06**			**0.1**	

TABLE 15
Risk Characterization Detail - Future Residential Exposure to Surface Soi
Screening Level HHRA for the Area of Former Buildings 82 and 603

UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth, ft bgs	Chemical of Potential Concern	Sample Conc	Units	Cancer RBSL	Cancer Risk	Contribution	Non-Cancer RBSL	Non-Cancer Hazard Quotient	% Contribution
SS-06	9/23/2010	2.5 - 3.5	Barium	481	mg/kg	---	---	---	1.5E+03	0.03	100.0
			Benzo (a) anthracene	4	ug/kg	1.5E+02	2.9E-08	7.5	---	---	---
			Benzo (a) pyrene	4	ug/kg	1.5E+01	3.0E-07	76.0	---	---	---
			Benzo (b) fluoranthene	6	ug/kg	1.5E+02	3.7E-08	9.4	---	---	---
			Benzo(k)fluoranthene	5	ug/kg	1.5E+03	3.0E-09	0.8	---	---	---
			Indeno (1,2,3-c,d) pyrene	4	ug/kg	1.5E+02	2.4E-08	6.1	---	---	---
		SS-06 - Soil on 9/23/2010 Total Risk					**4.E-07**			**0.03**	
SS-07	9/23/2010	2 - 3	Barium	328	mg/kg	---	---	---	1.5E+03	0.02	8.3
			Benzo (a) anthracene	21	ug/kg	1.5E+02	1.4E-07	7.5	---	---	---
			Benzo (a) pyrene	21	ug/kg	1.5E+01	1.4E-06	76.4	---	---	---
			Benzo (b) fluoranthene	27	ug/kg	1.5E+02	1.8E-07	9.7	---	---	---
			Benzo(k)fluoranthene	19	ug/kg	1.5E+03	1.3E-08	0.7	---	---	---
			Indeno (1,2,3-c,d) pyrene	16	ug/kg	1.5E+02	1.0E-07	5.6	---	---	---
			Mercury	2	mg/kg	---	---	---	1.0E+00	0.2	91.7
		SS-07 - Soil on 9/23/2010 Total Risk					**2.E-06**			**0.2**	
SS-08	9/23/2010	1 - 2	Barium	189 J	mg/kg	---	---	---	1.5E+03	0.01	100.0
		SS-08 - Soil on 9/23/2010 Total Risk								**0.01**	
SS-09	9/23/2010	1 - 2	Barium	644	mg/kg	---	---	---	1.5E+03	0.04	100.0
			Benzo (a) anthracene	3	ug/kg	1.5E+02	2.3E-08	43.0	---	---	---
			Benzo (b) fluoranthene	5	ug/kg	1.5E+02	3.0E-08	56.2	---	---	---
		SS-09 - Soil on 9/23/2010 Total Risk					**5.E-08**			**0.04**	
SS-10	9/23/2010	1-2	Barium	177	mg/kg	---	---	---	1.5E+03	0.01	100.0
		SS-10 - Soil on 9/23/2010 Total Risk								**0.01**	
SS-11	9/23/2010	1 - 2	Barium	115	mg/kg	---	---	---	1.5E+03	<0.01	100.0
			Benzo (a) anthracene	363 J	ug/kg	1.5E+02	2.4E-06	5.1	---	---	---
			Benzo (a) pyrene	465 J	ug/kg	1.5E+01	3.1E-05	65.0	---	---	---
			Benzo (b) fluoranthene	533 J	ug/kg	1.5E+02	3.6E-06	7.4	---	---	---
			Benzo(k)fluoranthene	455 J	ug/kg	1.5E+03	3.0E-07	0.6	---	---	---
			Dibenzo (a,h) anthracene	119 J	ug/kg	1.5E+01	7.9E-06	16.6	---	---	---
			Indeno (1,2,3-c,d) pyrene	368 J	ug/kg	1.5E+02	2.5E-06	5.1	---	---	---
		SS-11 - Soil on 9/23/2010 Total Risk					**5.E-05**			**<0.01**	
SS-12	9/23/2010	0 - 1	Barium	422	mg/kg	---	---	---	1.5E+03	0.03	100.0
		SS-12 - Soil on 9/23/2010 Total Risk			mg/kg					**0.03**	

Notes:

ft bgs	feet below ground surface
mg/kg	milligrams kilogram
ug/kg	micrograms per kilogram
NA	not applicable
---	Toxicity data not available
J	Estimated result
RBSL	Risk-based screening levels are from the USEPA Regional Screening Level table for Residential Soil (June 2011), based on a target risk of 1E-06 and a hazard quotient of 0.1

TABLE 16

Risk Characterization Summary - Future Residential Exposure to Surface Soil

Screening Level HHRA for the Area of Former Buildings 82 and 603

UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth (ft bgs)	Total Cancer Risk	Chemical with Highest % Contribution to Cancer Risk	Non-Cancer Hazard Index	Chemical with Highest % Contribution to Non-Cancer Hazard Index
SCFM-C-01	5/26/2004	0.5 - 1.5	NA	NA	<0.01	Barium (100%)
SCFM-C-04	5/25/2004	1 - 2	NA	NA	<0.01	Barium (100%)
SCFM-C-07	5/25/2004	1 - 2	NA	NA	<0.01	Barium (100%)
SS-01	9/23/2010	1.5 - 2.5	4.E-06	Benzo (a) pyrene (64%)	0.1	Barium (100%)
SS-02	9/23/2010	0.5 - 1.5	2.E-04	Benzo (a) pyrene (68%)	0.05	Barium (100%)
SS-04	9/23/2010	1 - 2	9.E-07	Benzo (a) pyrene (78%)	0.02	Barium (100%)
SS-05	9/23/2010	0.5 - 1.5	5.E-06	Benzo (a) pyrene (67%)	0.1	Barium (100%)
SS-06	9/23/2010	2.5 - 3.5	4.E-07	Benzo (a) pyrene (76%)	0.03	Barium (100%)
SS-07	9/23/2010	2 - 3	2.E-06	Benzo (a) pyrene (76%)	0.2	Mercury (92%)
SS-08	9/23/2010	1 - 2	NA	NA	0.01	Barium (100%)
SS-09	9/23/2010	1 - 2	5.E-08	Benzo (b) fluoranthene (56%)	0.04	Barium (100%)
SS-10	9/23/2010	1 - 2	NA	NA	0.01	Barium (100%)
SS-11	9/23/2010	1 - 2	5.E-05	Benzo (a) pyrene (65%)	<0.01	Barium (100%)
SS-12	9/23/2010	0 - 1	NA	NA	0.03	Barium (100%)

Notes:

ft bgs = feet below ground surface

NA = not applicable

TABLE 17
Risk Characterization Detail - Future Trespasser Exposure to Surface Soil
Screening Level HHRA for the Area of Former Buildings 82 and 603

UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth, ft bgs	Chemical of Potential Concern	Sample Conc	Units	Cancer RBSL	Cancer Risk	Contribution	Non-Cancer RBSL	Non-Cancer Hazard Quotient	% Contribution
SCFM-C-01	5/26/2004	0.5-1.5	Barium	95	mg/kg	---	---	---	1.0E+04	<0.01	100.0
		SCFM-C-01 - Soil on 5/26/2004 Total Risk								**<0.01**	
SCFM-C-04	5/25/2004	1-2	Barium	38	mg/kg	---	---	---	1.0E+04	<0.01	100.0
		SCFM-C-04 - Soil on 5/25/2004 Total Risk								**<0.01**	
SCFM-C-05	5/25/2004	1-2	Barium	113	mg/kg	---	---	---	1.0E+04	<0.01	100.0
		SCFM-C-04 - Soil on 5/25/2004 Total Risk								**<0.01**	
SCFM-C-07	5/25/2004	1-2	Barium	23	mg/kg	---	---	---	1.0E+04	<0.01	100.0
		SCFM-C-07 - Soil on 5/25/2004 Total Risk								**<0.01**	
SS-01	9/23/2010	1.5 - 2.5	Barium	2,100	mg/kg	---	---	---	1.0E+04	0.02	100.0
			Benzo (a) anthracene	40	ug/kg	1.0E+03	3.9E-08	6.2	---	---	---
			Benzo (a) pyrene	41	ug/kg	1.0E+02	4.0E-07	63.7	---	---	---
			Benzo (b) fluoranthene	53	ug/kg	1.0E+03	5.2E-08	8.3	---	---	---
			Benzo(k)fluoranthene	37	ug/kg	1.0E+04	3.7E-09	0.6	---	---	---
			Dibenzo (a,h) anthracene	10	ug/kg	1.0E+02	1.0E-07	16.4	---	---	---
			Indeno (1,2,3-c,d) pyrene	30	ug/kg	1.0E+03	3.0E-08	4.7	---	---	---
		SS-01 - Soil on 9/23/2010 Total Risk					**6.E-07**			**0.02**	
SS-02	9/23/2010	0.5 - 1.5	Barium	705	mg/kg	---	---	---	1.0E+04	<0.01	100
			Benzo (a) anthracene	2,180	ug/kg	1.0E+03	2.2E-06	7.5	---	---	---
			Benzo (a) pyrene	1,970	ug/kg	1.0E+02	2.0E-05	67.9	---	---	---
			Benzo (b) fluoranthene	1,820	ug/kg	1.0E+03	1.8E-06	6.3	---	---	---
			Benzo(k)fluoranthene	1,880	ug/kg	1.0E+04	1.9E-07	0.6	---	---	---
			Dibenzo (a,h) anthracene	391	ug/kg	1.0E+02	3.9E-06	13.5	---	---	---
			Indeno (1,2,3-c,d) pyrene	1,210	ug/kg	1.0E+03	1.2E-06	4.2	---	---	---
		SS-02 - Soil on 9/23/2010 Total Risk					**3.E-05**			**<0.01**	
SS-04	9/23/2010	1 - 2	Barium	255	mg/kg	---	---	---	1.0E+04	<0.01	100.0
			Benzo (a) anthracene	11	ug/kg	1.0E+03	1.1E-08	7.9	---	---	---
			Benzo (a) pyrene	11	ug/kg	1.0E+02	1.1E-07	78.2	---	---	---
			Benzo (b) fluoranthene	11	ug/kg	1.0E+03	1.1E-08	7.9	---	---	---
			Benzo(k)fluoranthene	11	ug/kg	1.0E+04	1.1E-09	0.8	---	---	---
			Indeno (1,2,3-c,d) pyrene	7	ug/kg	1.0E+03	7.2E-09	5.1	---	---	---
		SS-04 - Soil on 9/23/2010 Total Risk					**1.E-07**			**<0.01**	
SS-05	9/23/2010	0.5 - 1.5	Barium	2,020	mg/kg	---	---	---	1.0E+04	0.02	100.0
			Benzo (a) anthracene	53	ug/kg	1.0E+03	5.2E-08	6.5	---	---	---
			Benzo (a) pyrene	54	ug/kg	1.0E+02	5.3E-07	66.6	---	---	---
			Benzo (b) fluoranthene	48	ug/kg	1.0E+03	4.8E-08	6.0	---	---	---
			Benzo(k)fluoranthene	50	ug/kg	1.0E+04	4.9E-09	0.6	---	---	---
			Dibenzo (a,h) anthracene	13	ug/kg	1.0E+02	1.2E-07	15.5	---	---	---
			Indeno (1,2,3-c,d) pyrene	39	ug/kg	1.0E+03	3.8E-08	4.8	---	---	---
		SS-05 - Soil on 9/23/2010 Total Risk					**8.E-07**			**0.02**	
SS-06	9/23/2010	2.5 - 3.5	Barium	481	mg/kg	---	---	---	1.0E+04	<0.01	100.0
			Benzo (a) anthracene	4	ug/kg	1.0E+03	4.4E-09	7.5	---	---	---
			Benzo (a) pyrene	4	ug/kg	1.0E+02	4.4E-08	76.0	---	---	---
			Benzo (b) fluoranthene	6	ug/kg	1.0E+03	5.5E-09	9.4	---	---	---
			Benzo(k)fluoranthene	5	ug/kg	1.0E+04	4.5E-10	0.8	---	---	---
			Indeno (1,2,3-c,d) pyrene	4	ug/kg	1.0E+03	3.6E-09	6.1	---	---	---
		SS-06 - Soil on 9/23/2010 Total Risk					**6.E-08**			**<0.01**	
SS-07	9/23/2010	2 - 3	Barium	328	mg/kg	---	---	---	1.0E+04	<0.01	49.8
			Benzo (a) anthracene	21	ug/kg	1.0E+03	2.0E-08	7.5	---	---	---
			Benzo (a) pyrene	21	ug/kg	1.0E+02	2.1E-07	76.4	---	---	---
			Benzo (b) fluoranthene	27	ug/kg	1.0E+03	2.6E-08	9.7	---	---	---
			Benzo(k)fluoranthene	19	ug/kg	1.0E+04	1.9E-09	0.7	---	---	---
			Indeno (1,2,3-c,d) pyrene	16	ug/kg	1.0E+03	1.5E-08	5.6	---	---	---
			Mercury	2	mg/kg	---	---	---	6.7E+01	<0.01	50.2
		SS-07 - Soil on 9/23/2010 Total Risk					**3.E-07**			**<0.01**	
SS-08	9/23/2010	1 - 2	Barium	189 J	mg/kg	---	---	---	1.0E+04	<0.01	100.0
		SS-08 - Soil on 9/23/2010 Total Risk								**<0.01**	
SS-09	9/23/2010	1 - 2	Barium	644	mg/kg	---	---	---	1.0E+04	<0.01	100.0
			Benzo (a) anthracene	3	ug/kg	1.0E+03	3.4E-09	43.0	---	---	---
			Benzo (b) fluoranthene	5	ug/kg	1.0E+03	4.5E-09	56.2	---	---	---
		SS-09 - Soil on 9/23/2010 Total Risk					**8.E-09**			**<0.01**	
SS-10	9/23/2010	1-2	Barium	177	mg/kg	---	---	---	1.0E+04	<0.01	100.0
		SS-10 - Soil on 9/23/2010 Total Risk								**<0.01**	
SS-11	9/23/2010	1 - 2	Barium	115	mg/kg	---	---	---	1.0E+04	<0.01	100.0
			Benzo (a) anthracene	363 J	ug/kg	1.0E+03	3.6E-07	5.1	---	---	---
			Benzo (a) pyrene	465 J	ug/kg	1.0E+02	4.6E-06	65.0	---	---	---
			Benzo (b) fluoranthene	533 J	ug/kg	1.0E+03	5.3E-07	7.4	---	---	---
			Benzo(k)fluoranthene	455 J	ug/kg	1.0E+04	4.5E-08	0.6	---	---	---
			Dibenzo (a,h) anthracene	119 J	ug/kg	1.0E+02	1.2E-06	16.6	---	---	---
			Indeno (1,2,3-c,d) pyrene	368 J	ug/kg	1.0E+03	3.6E-07	5.1	---	---	---
		SS-11 - Soil on 9/23/2010 Total Risk					**7.E-06**			**<0.01**	
SS-12	9/23/2010	0 - 1	Barium	422	mg/kg	---	---	---	1.0E+04	<0.01	100.0
		SS-12 - Soil on 9/23/2010 Total Risk			mg/kg					**<0.01**	

Notes:

ft bgs	feet below ground surface
mg/kg	milligrams kilogram
ug/kg	micorgrams per kilogram
NA	not applicable
---	Toxicity data not available
J	Estimated result
RBSL	Risk-based screening levels are from the USEPA Regional Screening Level table for Residential Soil (June 2011), based on a target risk of 1E-06 and a hazard quotient of 0.1. Screening levels for a trespasser scenario are based on residential soil RSLs adjusted for an exposure frequency of 52 days/year.

TABLE 18

Risk Characterization Summary - Future Trespasser Exposure to Surface Soil

Screening Level HHRA for the Area of Former Buildings 82 and 603

UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth (ft bgs)	Total Cancer Risk	Chemical with Highest % Contribution to Cancer Risk	Non-Cancer Hazard Index	Chemical with Highest % Contribution to Non-Cancer Hazard Index
SCFM-C-01	5/26/2004	0.5 - 1.5	NA	NA	<0.01	Barium (100%)
SCFM-C-04	5/25/2004	1 - 2	NA	NA	<0.01	Barium (100%)
SCFM-C-05	5/28/2004	1 - 2	NA	NA	<0.01	Barium (100%)
SCFM-C-07	5/25/2004	1 - 2	NA	NA	<0.01	Barium (100%)
SS-01	9/23/2010	1.5 - 2.5	6.E-07	Benzo (a) pyrene (64%)	0.02	Barium (100%)
SS-02	9/23/2010	0.5 - 1.5	3.E-05	Benzo (a) pyrene (68%)	<0.01	Barium (100%)
SS-04	9/23/2010	1 - 2	1.E-07	Benzo (a) pyrene (78%)	<0.01	Barium (100%)
SS-05	9/23/2010	0.5 - 1.5	8.E-07	Benzo (a) pyrene (67%)	0.02	Barium (100%)
SS-06	9/23/2010	2.5 - 3.5	6.E-08	Benzo (a) pyrene (76%)	<0.01	Barium (100%)
SS-07	9/23/2010	2 - 3	3.E-07	Benzo (a) pyrene (76%)	<0.01	Mercury (92%)
SS-08	9/23/2010	1 - 2	NA	NA	<0.01	Barium (100%)
SS-09	9/23/2010	1 - 2	8.E-09	Benzo (b) fluoranthene (56%)	<0.01	Barium (100%)
SS-10	9/23/2010	1 - 2	NA	NA	<0.01	Barium (100%)
SS-11	9/23/2010	1 - 2	7.E-06	Benzo (a) pyrene (65%)	<0.01	Barium (100%)
SS-12	9/23/2010	0 - 1	NA	NA	<0.01	Barium (100%)

Notes:

ft bgs = feet below ground surface

NA = not applicable

TABLE 19
Risk Characterization Detail - Future Industrial Exposure to Surface Soil
Screening Level HHRA for the Area of Former Buildings 82 and 603

UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth, ft bgs	Chemical of Potential Concern	Sample Conc	Units	Cancer RBSL	Cancer Risk	Contribution	Non-Cancer RBSL	Non-Cancer Hazard Quotient	% Contribution
BLD82EPC*	NA	NA	Aroclor-1260	249	ug/kg	7.4E+02	3.4E-07	1.4	---	---	---
			Barium	787	mg/kg	---	---	---	1.9E+04	0.004	15.5
			Benzo (a) anthracene	10,600	ug/kg	2.1E+03	5.0E-06	20.3	---	---	---
			Benzo (a) pyrene	2,450	ug/kg	2.1E+02	1.2E-05	47.0	---	---	---
			Benzo (b) fluoranthene	8,880	ug/kg	2.1E+03	4.2E-06	17.0	---	---	---
			Benzo(k)fluoranthene	2,140	ug/kg	2.1E+04	1.0E-07	0.4	---	---	---
			Chrysene	10,100	ug/kg	2.1E+05	4.8E-08	0.2	---	---	---
			Dibenzo (a,h) anthracene	556	ug/kg	2.1E+02	2.6E-06	10.7	---	---	---
			Indeno (1,2,3-c,d) pyrene	1,540	ug/kg	2.1E+03	7.3E-07	3.0	---	---	---
			Mercury	1.0	mg/kg	---	---	---	4.3E+00	0.02	84.5
		BLD82EPC - Soil on 9/23/2010 Total Risk					**2.E-05**			**0.03**	
SCFM-C-01	5/26/2004	0.5-1.5	Barium	95	mg/kg	---	---	---	1.9E+04	<0.01	100.0
		SCFM-C-01 - Soil on 5/26/2004 Total Risk								**<0.01**	
SCFM-C-04	5/25/2004	1-2	Barium	38	mg/kg	---	---	---	1.9E+04	<0.01	100.0
		SCFM-C-04 - Soil on 5/25/2004 Total Risk								**<0.01**	
SCFM-C-05	5/25/2004	1-2	Barium	113	mg/kg	---	---	---	1.9E+04	<0.01	100.0
		SCFM-C-04 - Soil on 5/25/2004 Total Risk								**<0.01**	
SCFM-C-07	5/25/2004	1-2	Barium	23	mg/kg	---	---	---	1.9E+04	<0.01	100.0
		SCFM-C-07 - Soil on 5/25/2004 Total Risk								**<0.01**	
SS-01	9/23/2010	1.5 - 2.5	Barium	2,100	mg/kg	---	---	---	1.9E+04	0.01	100.0
			Benzo (a) anthracene	40	ug/kg	2.1E+03	1.9E-08	6.2	---	---	---
			Benzo (a) pyrene	41	ug/kg	2.1E+02	1.9E-07	63.7	---	---	---
			Benzo (b) fluoranthene	53	ug/kg	2.1E+03	2.5E-08	8.3	---	---	---
			Benzo(k)fluoranthene	37	ug/kg	2.1E+04	1.8E-09	0.6	---	---	---
			Chrysene	67	ug/kg	2.1E+05	3.2E-10	0.1	---	---	---
			Dibenzo (a,h) anthracene	10	ug/kg	2.1E+02	5.0E-08	16.4	---	---	---
			Indeno (1,2,3-c,d) pyrene	30	ug/kg	2.1E+03	1.4E-08	4.7	---	---	---
		SS-02 - Soil on 9/23/2010 Total Risk					**3.E-07**			**0.01**	
SS-02	9/23/2010	0.5 - 1.5	Aroclor-1260	56	ug/kg	7.4E+02	7.6E-08	0.5	---	---	---
			Barium	705	mg/kg	---	---	---	1.5E+03	0.05	100.0
			Benzo (a) anthracene	2,180	ug/kg	2.1E+03	1.0E-06	7.5	---	---	---
			Benzo (a) pyrene	1,970	ug/kg	2.1E+02	9.4E-06	67.5	---	---	---
			Benzo (b) fluoranthene	1,820	ug/kg	2.1E+03	8.7E-07	6.2	---	---	---
			Benzo(k)fluoranthene	1,880	ug/kg	2.1E+04	9.0E-08	0.6	---	---	---
			Chrysene	2,030	ug/kg	2.1E+05	9.7E-09	0.1	---	---	---
			Dibenzo (a,h) anthracene	391	ug/kg	2.1E+02	1.9E-06	13.4	---	---	---
			Indeno (1,2,3-c,d) pyrene	1,210	ug/kg	2.1E+03	5.8E-07	4.1	---	---	---
		SS-02 - Soil on 9/23/2010 Total Risk					**1.E-05**			**0.05**	
SS-04	9/23/2010	1 - 2	Barium	255	mg/kg	---	---	---	1.9E+04	<0.01	100.0
			Benzo (a) anthracene	11	ug/kg	2.1E+03	5.3E-09	7.9	---	---	---
			Benzo (a) pyrene	11	ug/kg	2.1E+02	5.3E-08	78.2	---	---	---
			Benzo (b) fluoranthene	11	ug/kg	2.1E+03	5.3E-09	7.9	---	---	---
			Benzo(k)fluoranthene	11	ug/kg	2.1E+04	5.2E-10	0.8	---	---	---
			Chrysene	12	ug/kg	2.1E+05	5.6E-11	0.1	---	---	---
			Indeno (1,2,3-c,d) pyrene	7	ug/kg	2.1E+03	3.5E-09	5.1	---	---	---
		SS-04 - Soil on 9/23/2010 Total Risk					**7.E-08**			**<0.01**	
SS-05	9/23/2010	0.5 - 1.5	Barium	2,020	mg/kg	---	---	---	1.9E+04	0.01	100.0
			Benzo (a) anthracene	53	ug/kg	2.1E+03	2.5E-08	5.6	---	---	---
			Benzo (a) pyrene	54	ug/kg	2.1E+02	2.6E-07	57.0	---	---	---
			Benzo (b) fluoranthene	48	ug/kg	2.1E+03	2.3E-08	5.1	---	---	---
			Benzo(k)fluoranthene	50	ug/kg	2.1E+04	2.4E-09	0.5	---	---	---
			Chrysene	60	ug/kg	2.1E+05	2.8E-10	0.1	---	---	---
			Dibenzo (a,h) anthracene	13	ug/kg	1.0E+02	1.2E-07	27.6	---	---	---
			Indeno (1,2,3-c,d) pyrene	39	ug/kg	2.1E+03	1.8E-08	4.1	---	---	---
		SS-05 - Soil on 9/23/2010 Total Risk					**4.E-07**			**0.01**	
SS-06	9/23/2010	2.5 - 3.5	Barium	481	mg/kg	---	---	---	1.9E+04	<0.01	100.0
			Benzo (a) anthracene	4	ug/kg	2.1E+03	2.1E-09	7.5	---	---	---
			Benzo (a) pyrene	4	ug/kg	2.1E+02	2.1E-08	76.0	---	---	---

TABLE 19
Risk Characterization Detail - Future Industrial Exposure to Surface Soil
Screening Level HHRA for the Area of Former Buildings 82 and 603

UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth, ft bgs	Chemical of Potential Concern	Sample Conc	Units	Cancer RBSL	Cancer Risk	Contribution	Non-Cancer RBSL	Non-Cancer Hazard Quotient	% Contribution
			Benzo (b) fluoranthene	6	ug/kg	2.1E+03	2.6E-09	9.4	---	---	---
			Benzo(k)fluoranthene	5	ug/kg	2.1E+04	2.2E-10	0.8	---	---	---
			Chrysene	6	ug/kg	2.1E+05	2.9E-11	0.1	---	---	---
			Indeno (1,2,3-c,d) pyrene	4	ug/kg	2.1E+03	1.7E-09	6.1	---	---	---
		SS-06 - Soil on 9/23/2010 Total Risk					**3.E-08**			**<0.01**	
SS-07	9/23/2010	2 - 3	Barium	328	mg/kg	---	---	---	1.9E+04	<0.01	3.3
			Benzo (a) anthracene	21	ug/kg	2.1E+03	9.8E-09	7.5	---	---	---
			Benzo (a) pyrene	21	ug/kg	2.1E+02	1.0E-07	76.4	---	---	---
			Benzo (b) fluoranthene	27	ug/kg	2.1E+03	1.3E-08	9.7	---	---	---
			Benzo(k)fluoranthene	19	ug/kg	2.1E+04	9.1E-10	0.7	---	---	---
			Chrysene	33	ug/kg	2.1E+05	1.6E-10	0.1	---	---	---
			Indeno (1,2,3-c,d) pyrene	16	ug/kg	2.1E+03	7.4E-09	5.6	---	---	---
			Mercury	2	mg/kg	---	---	---	4.3E+00	0.05	96.7
		SS-07 - Soil on 9/23/2010 Total Risk					**1.E-07**			**0.05**	
SS-08	9/23/2010	1 - 2	Barium	189 J	mg/kg	---	---	---	1.9E+04	<0.01	100.0
		SS-08 - Soil on 9/23/2010 Total Risk								**<0.01**	
SS-09	9/23/2010	1 - 2	Barium	644	mg/kg	---	---	---	1.9E+04	<0.01	100.0
			Benzo (a) anthracene	3	ug/kg	2.1E+03	1.6E-09	43.0	---	---	---
			Benzo (b) fluoranthene	5	ug/kg	2.1E+03	2.2E-09	56.2	---	---	---
			Chrysene	6	ug/kg	2.1E+05	2.8E-11	0.7	---	---	---
		SS-09 - Soil on 9/23/2010 Total Risk					**4.E-09**			**<0.01**	
SS-10	9/23/2010	1-2	Barium	177	mg/kg	---	---	---	1.9E+04	<0.01	100.0
		SS-10 - Soil on 9/23/2010 Total Risk								**<0.01**	
SS-11	9/23/2010	1 - 2	Barium	115	mg/kg	---	---	---	1.9E+04	<0.01	100.0
			Benzo (a) anthracene	363 J	ug/kg	2.1E+03	1.7E-07	5.1	---	---	---
			Benzo (a) pyrene	456 J	ug/kg	2.1E+02	2.2E-06	64.5	---	---	---
			Benzo (b) fluoranthene	533 J	ug/kg	2.1E+03	2.5E-07	7.5	---	---	---
			Benzo(k)fluoranthene	455 J	ug/kg	2.1E+04	2.2E-08	0.6	---	---	---
			Chrysene	508 J	ug/kg	2.1E+05	2.4E-09	0.1	---	---	---
			Dibenzo (a,h) anthracene	119 J	ug/kg	2.1E+02	5.7E-07	16.8	---	---	---
			Indeno (1,2,3-c,d) pyrene	368 J	ug/kg	2.1E+03	1.8E-07	5.2	---	---	---
		SS-11 - Soil on 9/23/2010 Total Risk					**3.E-06**			**<0.01**	
SS-12	9/23/2010	0 - 1	Barium	422	mg/kg	---	---	---	1.9E+04	<0.01	100.0
		SS-12 - Soil on 9/23/2010 Total Risk			mg/kg					**<0.01**	

Notes:
ft bgs feet below ground surface
mg/kg milligrams kilogram
ug/kg micrograms per kilogram
NA not applicable
--- Toxicity data not available
J Estimated result
RBSL Risk-based screening levels are from the USEPA Regional Screening Level table for Industrial Soil (June 2011) and based on a target risk of 1E-06 and a hazard quotient of 0.1.
* BLD82EPC is the Site-wide exposure point concentration, which includes data from sample location SS-03 at a depth interval of 1.5 to 2.5 feet below ground surface, a data point representative of construction debris that is not related to a Facility release.

TABLE 20

Risk Characterization Summary - Future Industrial Exposure to Surface Soil

Screening Level HHRA for the Area of Former Buildings 82 and 603

UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth (ft bgs)	Total Cancer Risk	Chemical with Highest % Contribution to Cancer Risk	Non-Cancer Hazard Index	Chemical with Highest % Contribution to Non-Cancer Hazard Index
BLD82EPC*	NA	NA	2.E-05	Benzo (a) pyrene (47%)	<0.01	Barium (100%)
SCFM-C-01	5/26/2004	0.5 - 1.5	NA	NA	<0.01	Barium (100%)
SCFM-C-04	5/25/2004	1 - 2	NA	NA	<0.01	Barium (100%)
SCFM-C-05	5/28/2004	1 - 2	NA	NA	<0.01	Barium (100%)
SCFM-C-07	5/25/2004	1 - 2	NA	NA	<0.01	Barium (100%)
SS-01	9/23/2010	1.5 - 2.5	3.E-07	Benzo (a) pyrene (64%)	0.01	Barium (100%)
SS-02	9/23/2010	0.5 - 1.5	1.E-05	Benzo (a) pyrene (67%)	<0.01	Barium (100%)
SS-04	9/23/2010	1 - 2	7.E-08	Benzo (a) pyrene (78%)	<0.01	Barium (100%)
SS-05	9/23/2010	0.5 - 1.5	4.E-07	Benzo (a) pyrene (57%)	0.01	Barium (100%)
SS-06	9/23/2010	2.5 - 3.5	3.E-08	Benzo (a) pyrene (76%)	<0.01	Barium (100%)
SS-07	9/23/2010	2 - 3	1.E-07	Benzo (a) pyrene (76%)	0.05	Mercury (97%)
SS-08	9/23/2010	1 - 2	NA	NA	<0.01	Barium (100%)
SS-09	9/23/2010	1 - 2	4.E-09	Benzo (b) fluoranthene (56%)	<0.01	Barium (100%)
SS-10	9/23/2010	1 - 2	NA	NA	<0.01	Barium (100%)
SS-11	9/23/2010	1 - 2	3.E-06	Benzo (a) pyrene (65%)	<0.01	Barium (100%)
SS-12	9/23/2010	0 - 1	NA	NA	<0.01	Barium (100%)

Notes:

ft bgs = feet below ground surface

NA = not applicable

* BLD82EPC is the Site-wide exposure point concentration, which includes data from sample location SS-03 at a depth interval of 1.5 to 2.5 feet below ground surface, a data point representative of construction debris that is not related to a Facility release.

TABLE 21
Risk Characterization Detail - Future Construction Worker Exposure to Total Soil
Screening Level HHRA for the Area of Former Buildings 82 and 603

UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth, ft bgs	Chemical of Potential Concern	Sample Conc	Units	Cancer RBSL	Cancer Risk	Contribution	Non-Cancer RBSL	Non-Cancer Hazard Quotient	% Contribution
SB-01	5/6/2002	2-4	Benzo (a) anthracene	3,060	ug/kg	2.1E+03	1.5E-06	9.8	---	---	---
			Benzo (a) pyrene	2,810	ug/kg	2.1E+02	1.3E-05	90.2	---	---	---
		SB-01 - Soil on 5/6/2002 Total Risk					**1.E-05**				
SB-05	5/7/2002	5.5-7.5	Benzo (a) anthracene	383	ug/kg	2.1E+03	1.8E-07	9.9	---	---	---
			Benzo (a) pyrene	348	ug/kg	2.1E+02	1.7E-06	90.1	---	---	---
		SB-05 - Soil on 5/7/2002 Total Risk					**2.E-06**				
SB-06	5/6/2002	2-4	Benzo (a) anthracene	339	ug/kg	2.1E+03	1.6E-07	9.1	---	---	---
			Benzo (a) pyrene	337	ug/kg	2.1E+02	1.6E-06	90.9	---	---	---
		SB-06 - Soil on 5/6/2002 Total Risk					**2.E-06**				
SB-07	5/6/2002	2-4	Benzo (a) anthracene	214	ug/kg	2.1E+03	1.0E-07	10.3	---	---	---
			Benzo (a) pyrene	187 J	ug/kg	2.1E+02	8.9E-07	89.7	---	---	---
		SB-07 - Soil on 5/6/2002 Total Risk					**1.E-06**				
SS-01	9/23/2010	1.5 - 2.5	Benzo (a) anthracene	40	ug/kg	2.1E+03	1.9E-08	7.2	---	---	---
			Benzo (a) pyrene	41	ug/kg	2.1E+02	1.9E-07	73.8	---	---	---
			Dibenzo (a,h) anthracene	10	ug/kg	2.1E+02	5.0E-08	19.0	---	---	---
		SS-01 - Soil on 9/23/2010 Total Risk					**3.E-07**				
SS-02	9/23/2010	0.5 - 1.5	Benzo (a) anthracene	2,180	ug/kg	2.1E+03	1.0E-06	8.5	---	---	---
			Benzo (a) pyrene	1,970	ug/kg	2.1E+02	9.4E-06	76.4	---	---	---
			Dibenzo (a,h) anthracene	391	ug/kg	2.1E+02	1.9E-06	15.2	---	---	---
		SS-02 - Soil on 9/23/2010 Total Risk					**1.E-05**				
SS-04	9/23/2010	1 - 2	Benzo (a) anthracene	11	ug/kg	2.1E+03	5.3E-09	9.2	---	---	---
			Benzo (a) pyrene	11	ug/kg	2.1E+02	5.3E-08	90.8	---	---	---
		SS-04 - Soil on 9/23/2010 Total Risk					**6.E-08**				
SS-05	9/23/2010	0.5 - 1.5	Benzo (a) anthracene	53	ug/kg	2.1E+03	2.5E-08	6.2	---	---	---
			Benzo (a) pyrene	54	ug/kg	2.1E+02	2.6E-07	63.2	---	---	---
			Dibenzo (a,h) anthracene	13	ug/kg	1.0E+02	1.2E-07	30.6	---	---	---
		SS-05 - Soil on 9/23/2010 Total Risk					**4.E-07**				
SS-06	9/23/2010	2.5 - 3.5	Benzo (a) anthracene	4	ug/kg	2.1E+03	2.1E-09	9.0	---	---	---
			Benzo (a) pyrene	4	ug/kg	2.1E+02	2.1E-08	91.0	---	---	---
		SS-06 - Soil on 9/23/2010 Total Risk					**2.E-08**				
SS-07	9/23/2010	2 - 3	Benzo (a) anthracene	21	ug/kg	2.1E+03	9.8E-09	8.9	---	---	---
			Benzo (a) pyrene	21	ug/kg	2.1E+02	1.0E-07	91.1	---	---	---
		SS-07 - Soil on 9/23/2010 Total Risk					**1.E-07**				
SS-09	9/23/2010	1 - 2	Benzo (a) anthracene	3	ug/kg	2.1E+03	1.6E-09	100.0	---	---	---
		SS-09 - Soil on 9/23/2010 Total Risk					**2.E-09**				
SS-11	9/23/2010	1 - 2	Benzo (a) anthracene	363 J	ug/kg	2.1E+03	1.7E-07	5.9	---	---	---
			Benzo (a) pyrene	456 J	ug/kg	2.1E+02	2.2E-06	74.6	---	---	---
			Dibenzo (a,h) anthracene	119 J	ug/kg	2.1E+02	5.7E-07	19.5	---	---	---
		SS-11 - Soil on 9/23/2010 Total Risk					**3.E-06**				

Notes:

ft bgs	feet below ground surface
mg/kg	milligrams kilogram
ug/kg	micrograms per kilogram
NA	not applicable
---	Toxicity data not available
J	Estimated result
RBSL	Risk-based screening levels are from the USEPA Regional Screening Level table for Industrial Soil (June 2011) and based on a target risk of 1E-06 and a hazard quotient of 0.1.

TABLE 22

Risk Characterization Summary - Future Construction Worker Exposure to Total Soil

Screening Level HHRA for the Area of Former Buildings 82 and 603

UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth (ft bgs)	Total Cancer Risk	Chemical with Highest % Contribution to Cancer Risk	Non-Cancer Hazard Index	Chemical with Highest % Contribution to Non-Cancer Hazard Index
SB-01	5/6/2002	2-4	1.E-05	Benzo (a) pyrene (90%)	NA	NA
SB-05	5/7/2002	5.5-7.5	2.E-06	Benzo (a) pyrene (90%)	NA	NA
SB-06	5/6/2002	2-4	2.E-06	Benzo (a) pyrene (91%)	NA	NA
SB-07	5/6/2002	2-4	1.E-06	Benzo (a) pyrene (90%)	NA	NA
SS-01	9/23/2010	1.5 - 2.5	3.E-07	Benzo (a) pyrene (74%)	NA	NA
SS-02	9/23/2010	0.5 - 1.5	1.E-05	Benzo (a) pyrene (76%)	NA	NA
SS-04	9/23/2010	1 - 2	6.E-08	Benzo (a) pyrene (91%)	NA	NA
SS-05	9/23/2010	0.5 - 1.5	4.E-07	Benzo (a) pyrene (63%)	NA	NA
SS-06	9/23/2010	2.5 - 3.5	2.E-08	Benzo (a) pyrene (91%)	NA	NA
SS-07	9/23/2010	2 - 3	1.E-07	Benzo (a) pyrene (91%)	NA	NA
SS-09	9/23/2010	1 - 2	2.E-09	Benzo (a) anthracene (100%)	NA	NA
SS-11	9/23/2010	1 - 2	3.E-06	Benzo (a) pyrene (75%)	NA	NA

Notes:

ft bgs = feet below ground surface

NA = not applicable

TABLE 23
Risk Characterization Summary - Future Residential Exposure to Groundwater via the Vapor Intrusion Pathway
Union Carbide Corporation
South Charleston, West Virginia

Constituent of Concern	Units	Screening Level [a]		Maximum Detected Concentration	Risk/HI Estimates	
		Carcinogenic	Noncarcinogenic		Carcinogenic Risk	Noncarcinogenic HI
Carbon tetrachloride	µg/L	3.73E+00	9.09E+00	7.97E+01	**2.1E-04**	0.9
Chloroform	µg/L	7.33E+00	6.67E+01	2.15E+01	**2.9E-05**	0.03
Vinyl chloride	µg/L	1.45E+00	9.09E+00	1.83E+01	**1.3E-04**	0.2
				Cumulative Estimates	**4E-04**	**1**

[a] Vapor Intrusion Screening Levels based on Regional Screening Levels (June 2011) for Residential Air, the unitless Henry's Law constant, a target risk = 1 x 10^{-5}, a hazard quotient = 0.1, and an attenuation factor = 0.001.

Bold indicates carcinogenic risk estimates above 1E-06 or a noncarcinogenic HI estimate above 1.
µg/L = micrograms per liter
HI = hazard index

TABLE 24
Risk Characterization Summary - Future Industrial Exposure to Groundwater via the Vapor Intrusion Pathway
Union Carbide Corporation
South Charleston, West Virginia

Constituent of Concern	Units	Screening Level [a]		Maximum Detected Concentration	Risk/HI Estimates	
		Carcinogenic	Noncarcinogenic		Carcinogenic Risk	Noncarcinogenic HI
Carbon tetrachloride	µg/L	1.90E+01	4.00E+01	7.97E+01	**4.2E-05**	0.2
Chloroform	µg/L	3.60E+01	2.85E+02	2.15E+01	**6.0E-06**	0.01
Vinyl chloride	µg/L	2.50E+01	4.00E+01	1.83E+01	**7.3E-06**	0.05
				Cumulative Estimates	**6E-05**	0.3

[a] Vapor Intrusion Screening Levels based on Regional Screening Levels (June 2011) for Residential Air, the unitless Henry's Law constant, a target risk = 1×10^{-5}, a hazard quotient = 0.1, and an attenuation factor = 0.001.

Bold indicates carcinogenic risk estimates above 1E-06 or a noncarcinogenic HI estimate above 1.

µg/L = micrograms per liter

HI = hazard index

Figures

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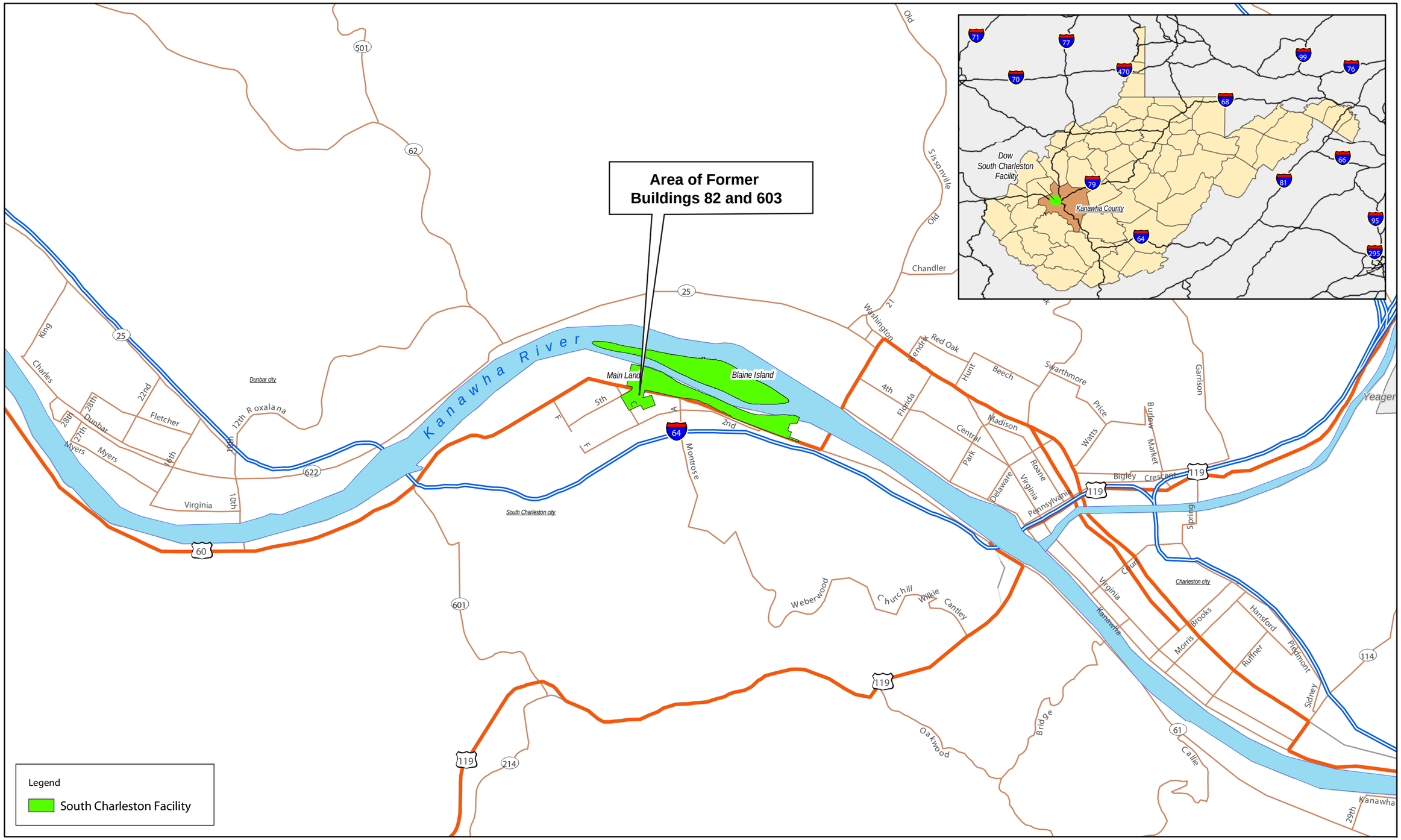

0 3,000 6,000
Feet

Figure 1
Site Location Map
Screening Level HHRA for the Area of Former Buildings 82 and 603
UCC South Charleston Facility, South Charleston, West Virginia

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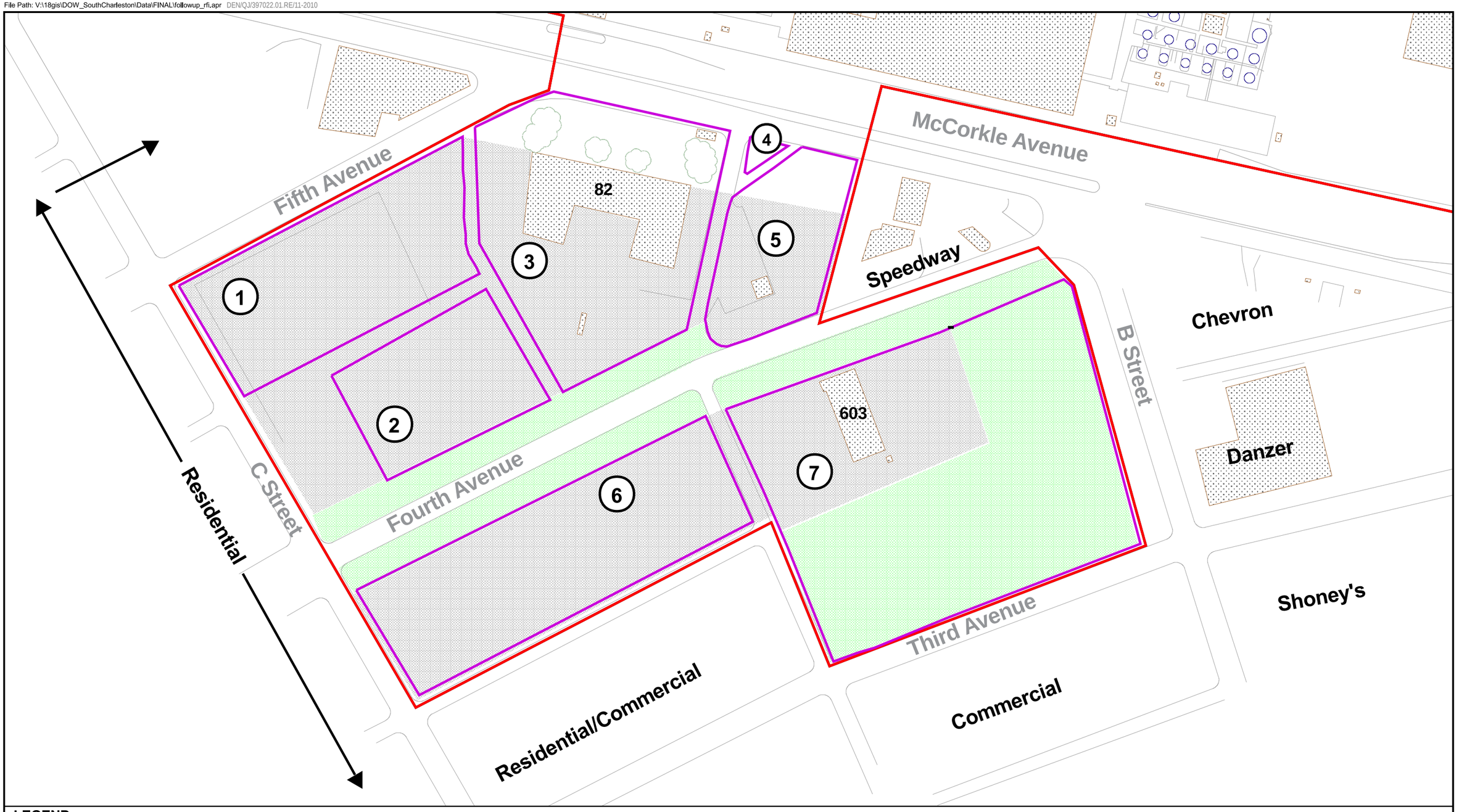
File Path: V:\18gis\DOW_SouthCharleston\Data\FINAL\followup_rfi.apr DEN/QJ/397022.01.RE/11-2010



LEGEND

- Surface Soil (0 - 1 ft. of soil) Sample
- Location of Proposed 2010 Surface Soil (0 - 1 ft. of soil) Sample
- Site Boundary
- Building footprints
- Landscaping
- Paved/Parking Lots
- Approximate Tract Boundaries
- (2) Tract Number

N

0 150 300 Feet

Figure 2
Site Map
Screening Level HHRA for the Area of Former Buildings 82 and 603
UCC South Charleston Facility, South Charleston, West Virginia

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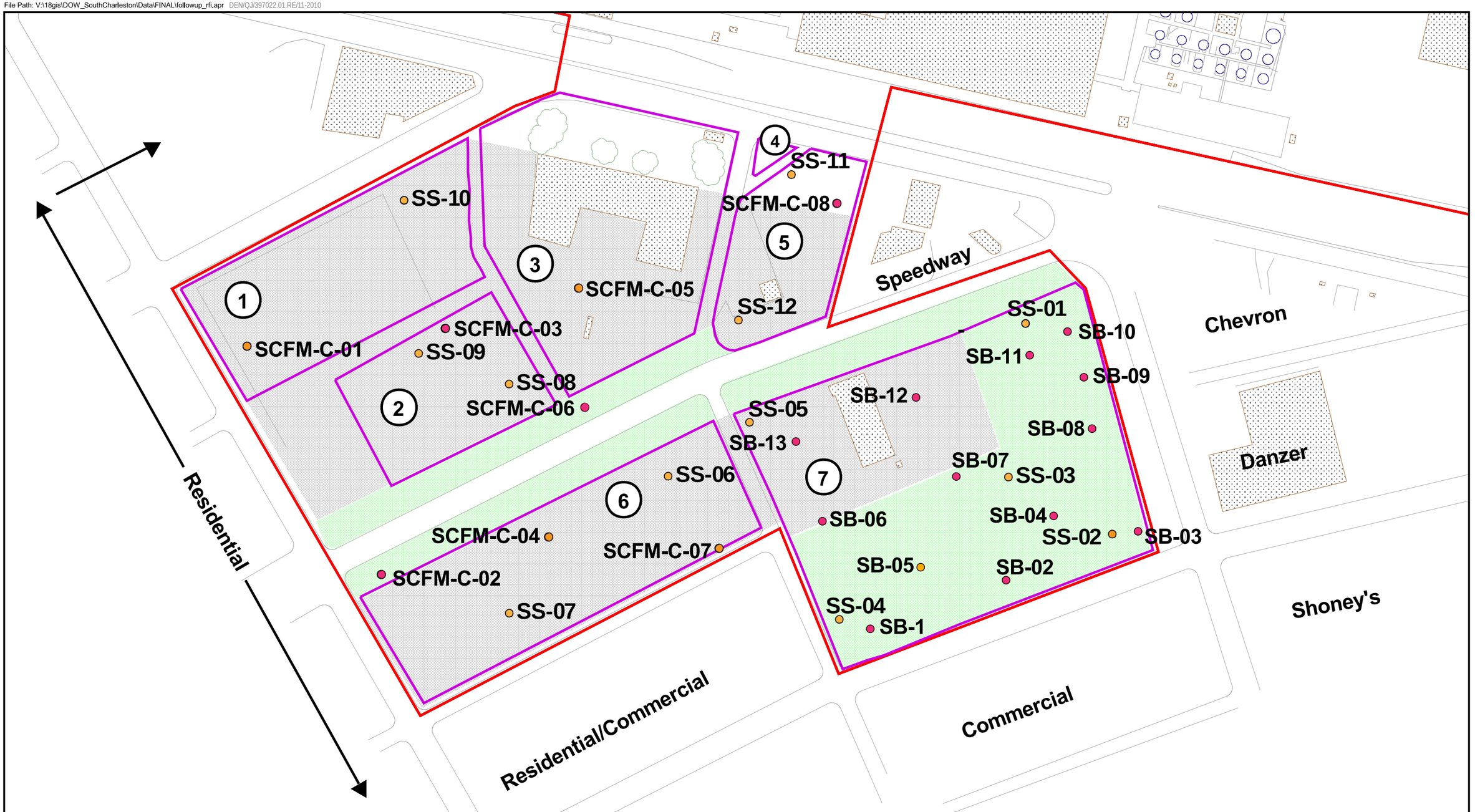

LEGEND

- Surface Soil Sample Location
- Subsurface Soil Sample Location
- Site Boundary
- Building footprints
- Landscaping
- Paved/Parking Lots
- Approximate Tract Boundaries
- (2) Tract Number

N

0 150 300 Feet

Figure 3
Soil Sample Locations
Screening Level HHRA for the Area of Former Buildings 82 and 603
UCC South Charleston Facility, South Charleston, West Virginia

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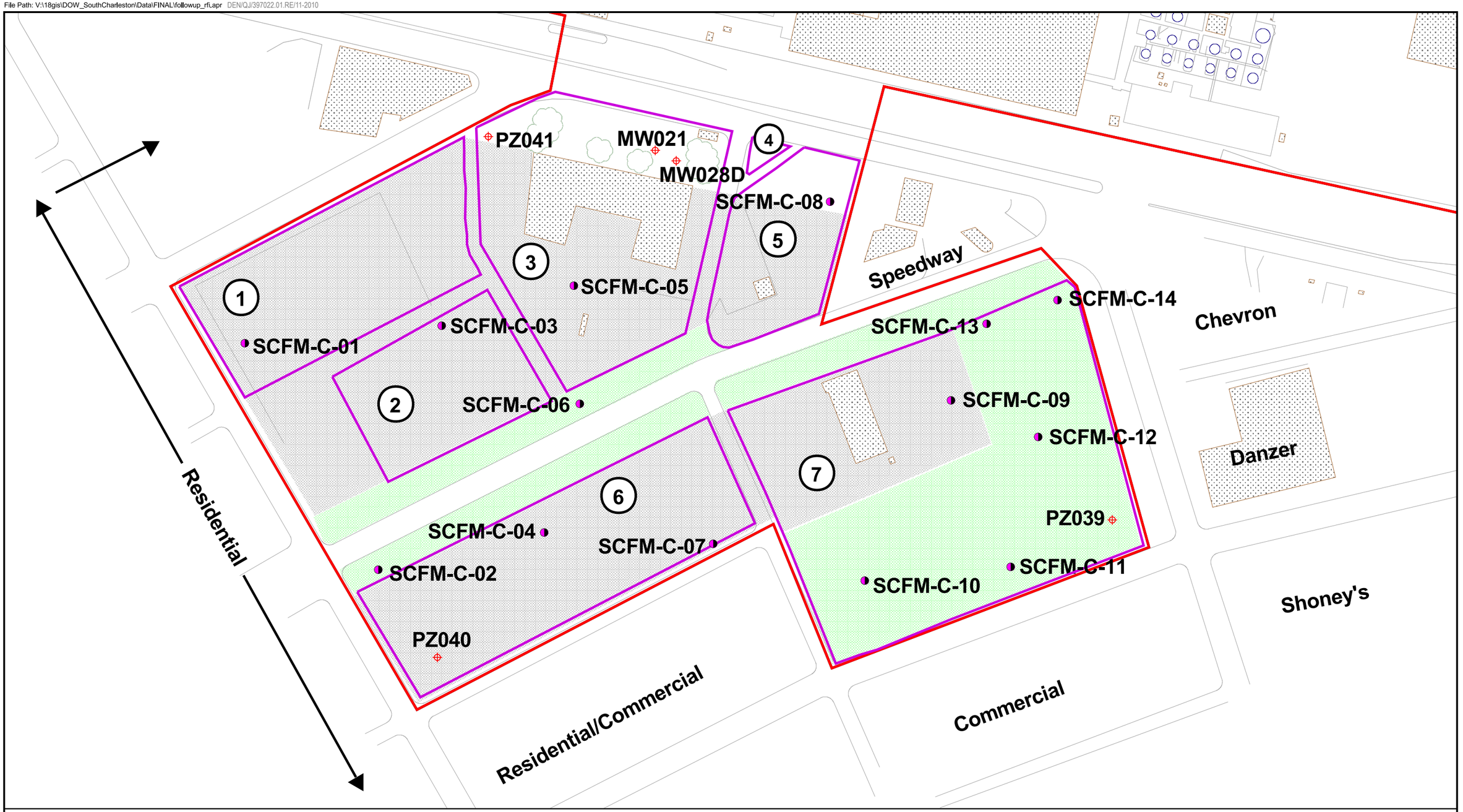

LEGEND

- Temporary Sampling Point
- Permanent Monitoring Well
- Site Boundary
- Building footprints
- Landscaping
- Paved/Parking Lots
- Approximate Tract Boundaries
- (2) Tract Number

N

0 150 300 Feet

Figure 4
Groundwater Sample Locations
Screening Level HHRA for the Area of Former Buildings 82 and 603
UCC South Charleston Facility, South Charleston, West Virginia

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Appendix A

Work Plan for 2010 Surface Soil Sampling in the Area of Former Buildings 82 and 603 (provided electronically on CD)

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Appendix B

Analytical Data and Validation Reports (provided electronically on CD)

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Appendix C

Focused Polynuclear Aromatic Hydrocarbon Soil Sampling

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Appendix C – Focused Polynuclear Aromatic Hydrocarbon Soil Sampling

C.1 Introduction

A focused soil investigation was conducted on May 6, 2011, in the vicinity of SS-03, the September 2010 sample location that showed elevated polynuclear aromatic hydrocarbon (PAH) concentrations. SS-03 was considered a potential PAH "hot spot", defined as a localized area of elevated contamination resulting in risks above the USEPA risk management range.

The body of this report identifies that PAHs in soil are attributed to the construction debris fill material (specifically fill material containing asphalt). Because multiple lines of evidence indicate that PAHs are not related to a release from the Facility, they are not subject to Resource Conservation and Recovery Act (RCRA) Corrective Action.

This appendix details the focused PAH soil sampling effort in the immediate vicinity of SS-03, located within Tract 7 at the area of former Buildings 82 and 603 (Site). It also includes a supplemental screening-level risk evaluation of SS-03 and the surrounding area containing construction debris with elevated PAH concentrations. This screening-level human health risk assessment (HHRA) is presented for the purpose of evaluating Tract 7 of the Site for future land reuse potential.

C.2 Field Investigation

The objective of the May 2011 focused PAH soil sampling was to evaluate the nature of the PAH contamination and delineate a potential PAH hot spot in the vicinity of location SS-03, in Tract 7 of the Site. The area of the investigation is shown on Figure C-1. Borings were performed at locations 5 feet and 10 feet from SS-03 in each of the four ordinal directions. The eight borings showed consistent lithology, with fill soil from surface to approximately 1 foot below ground surface (bgs). Construction debris consisting of crushed brick, concrete, asphalt, and gravel was typically encountered from 1 to 1.5 feet bgs. From about 1.5 feet to about 2.5 feet bgs, the construction debris became mixed with soil presumed to be native. Several cores showed primarily or all soil material at the terminal depth of 2.5 feet bgs; however, some cores still showed primarily fill material at this depth. Core photographs are included in Attachment C-1 provided electronically on CD.

Subsurface samples were collected at a depth of 1.5 to 2.5 feet bgs (consistent with the depth of sample SS-03) from the soil material surrounding the construction debris. Surface samples, with a depth interval of 0 to 1 foot bgs, were also collected from each step-out location, as well as one from the location of SS-03, itself, in order to collect data representative of the clean fill overlying the Site. Samples were submitted to Microbac Laboratories, Inc. in Marietta, Ohio, for analysis of PAHs by method SW8270C (analytical and validation reports are provided in Appendix B of this report).

C.3 Results and Screening-Level Comparison

The 5-foot step-out samples, both of the clean fill (0 to 1 foot bgs) and at a 1.5- to 2.5-foot bgs depth interval were analyzed first. The 10-foot step-out samples were held at the laboratory, and released for analysis if and when the benzo(a)pyrene toxicity equivalent (B[a]P equivalent) concentration for the associated 5-foot step-out sample was found to be greater than 10,100 micrograms per kilogram (µg/kg), the trespasser screening level at a 1×10^{-4} target risk. The 5-foot step-out samples with a B(a)P equivalent less than the noted trespasser screening level delineate the potential hot spot around locations SS-03; therefore, associated 10-foot step-out samples were not analyzed.

Analytical data are presented in Table 4 of the report. B(a)P equivalents for the May 2011 PAH investigation samples, as well as for all other Tract 7 samples, are presented in Table C-1. B(a)P equivalents for SS-03 and the surrounding step-out samples are also depicted in Figure C-1. Residential, trespasser, and industrial screening levels for the PAHs analyzed are also presented on Table C-1 for comparative purposes. The screening levels presented are based on June 2011 USEPA Regional Screening Levels (RSLs), a target risk of 1×10^{-4}, and a target hazard quotient (HQ) of 0.1. A less-conservative target risk of 1×10^{-4} was selected for this supplemental evaluation because screening processes appropriate for more conservative target risks such as selecting contaminants of potential concern are not included in this evaluation. Rather, all PAH concentrations are included in the B(a)P equivalents and, therefore, the risk estimates. Non-detect PAH concentrations were also included in the B(a)P equivalent calculations at a value equal to one-half of the reporting limit. As depicted on Figure C-1, the B(a)P equivalent concentration in sample SS-15, located to the north of SS-03, was lower than the 10,100-µg/kg trespasser screening level; therefore, the 10-foot step-out sample to the north, SS-19, was not analyzed. The other three 10-foot samples collected at the 1.5- to 2.5-foot bgs depth intervals (SS-17, SS-18, and SS-20) were analyzed, as the 5-foot step out samples at this depth contained B(a)P equivalent concentrations greater than 10,100 µg/kg. The surface soil samples collected from the 10-foot step-out samples were not analyzed as those from SS-03 and the surrounding 5-foot step-out samples showed PAHs were not detected or detected only at levels well below associated trespasser screening criteria at a 1×10^{-6} target risk level (101 µg/kg), thus sufficiently characterizing the clean fill.

Results of the 10-foot, 1.5- to 2.5-foot bgs step-out samples showed that 2 of the 3 samples analyzed (SS-17 and SS-18 to the south and east, respectively) showed concentrations exceeding 10,100 µg/kg. As a result, the PAH contamination is considered to be more widespread in the Tract 7 subsurface and, therefore, not a hot spot localized at SS-03. The analytical data, in combination with the lithological information obtained from photographs of the soil cores, and the fact that there are no known Facility-related activities in this area that may have resulted in PAHs in soil, indicate that the PAH contamination in this area of the site is the result of the asphalt present in the construction debris underlying the clean fill soil, and overlying the native soil where the original data from SS-03 were obtained in September 2010. Therefore, the data indicate the PAHs in soil are not attributable to a release from the Facility and, therefore, are not subject to RCRA Corrective Action. Therefore, risk assessment and related remediation decisions are not required. However, UCC has performed the following screening-level risk assessment to aid in land reuse and related management decisions.

C.4 Screening-Level Risk Evaluation

This supplemental screening-level risk evaluation is presented to aid in future land use decisions and should not be considered a complete evaluation without consideration of the risk assessment results presented in the body of this report. This screening-level evaluation is limited to the evaluation of potential future risks for residents, trespassers, and commercial/industrial workers exposed to construction debris in Tract 7 soils in the immediate vicinity of sample location SS-03. As presented in the report, current trespassers are considered exposed to the clean fill material rather than the underlying construction debris; therefore, no evaluation of the current trespasser exposure scenario is included in this appendix.

Risk estimates for the future resident, trespasser, and industrial worker exposed to soils at SS-03 at a depth of 1.5 to 2.5 ft bgs are presented in Tables C-2, C-3, and C-4, respectively. The carcinogenic risk estimate for the future resident is $1x10^{-3}$, above USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$. This risk estimate supports the conclusion reached in the report proposing only commercial/industrial reuse of the area. The noncancer hazard index (HI) estimate for residential exposure at SS-03 is below the threshold of 1.

The carcinogenic risk estimate for the trespasser is $2x10^{-4}$. Although this risk estimate is slightly above USEPA's risk management range, it is important to note that the grass and other covering in the area of SS-03 likely minimizes exposure. Additionally, the exposure parameters for the trespasser receptor assume exposure to Site surface soil once per week over a 30-year period. This is likely overly conservative based on actual Site use because informal Site observations indicate that trespassers may walk across the Site, but do not engage in regular activities where soil exposure would occur. The noncancer HI estimate for trespasser exposure at SS-03 is below the threshold of 1.

The carcinogenic risk estimate for the industrial worker exposed to construction debris at SS-03 is $1x10^{-4}$ and is equal to the upper end of USEPA's risk management range. The noncancer HI estimate for the industrial worker surface soil exposure scenario is below the threshold of 1.

An upper confidence limit on the mean (UCL) for B(a)P equivalent concentrations was also calculated using ProUCL version 4.1 in order to provide for a risk estimate representative of potential exposure to PAHs throughout Tract 7. Given the unique strata of the fill material in portions of Tract 7, and the fact that the construction debris contributing to elevated PAH concentrations is covered with approximately 1 foot of clean fill material, a 0- to 4-foot bgs depth interval was selected to represent future exposure upon potential redevelopment activities that could disturb and mix the soil in the upper depth interval. Note that an average concentration was selected to represent sample SS-03 and the surrounding step-out samples so as not to spatially bias the UCL toward the area of Tract 7 with the noted construction debris as the UCL is intended to represent exposure throughout Tract 7, rather than in one, localized place. B(a)P equivalents from the September 2010 sample as well as samples collected at 0- to 1-foot bgs and 1.5- to 2.5-foot bgs depth intervals in May 2011 were included in the SS-03 average concentration (9,733 µg/kg, Table C-1). Using all data from Tract 7, the associated UCL for B(a)P equivalents in Tract 7 soils is 2,586 µg/kg. The ProUCL input and output workbooks are included in Appendix D of the report.

The carcinogenic risk estimates associated with the associated UCL for B(a)P equivalents in Tract 7 soils (2,586 µg/kg) are presented in Table C-5 for the future resident, trespasser, and

commercial/industrial worker exposure scenarios. Risk estimates are $2x10^{-4}$, $3x10^{-5}$, and $1x10^{-5}$ for the future resident, trespasser, and industrial worker, respectively. The carcinogenic risk estimate for the resident is slightly greater than USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$, while those for the trespasser and industrial worker are within the risk management range. Again, risk estimates support the conclusion reached in the report proposing only commercial/industrial reuse of Tract 7. Noncancer HQs are not provided because benzo(a)pyrene does not have associated noncarcinogenic toxicity data.

C.5 Conclusions

Field and analytical data from the May 2011 sampling event indicate that PAH concentrations in the vicinity of SS-03 in Tract 7 are generally comparable to SS-03 and, therefore, do not constitute a hot spot localized at SS-03. Each of the May 2011 borings revealed construction debris used as fill material, consisting of crushed brick, gravel, and/or crushed asphalt, presumably from demolition of structures formerly located in this vicinity. Multiple lines of evidence indicate that the PAH concentrations noted in the native soil underlying the construction debris are attributable to the crushed asphalt within the fill overlying theses samples, given that UCC is unaware of any Facility-related activities in this area that may have resulted in PAHs in soil.

Risks associated with UCL for Tract 7, calculated using recent and historical Tract 7 samples from 0 to 4 feet bgs − a depth interval considered reasonably representative of future exposure given a soil mixing scenario upon redevelopment − is within the USEPA risk management range for non-residential use (i.e., commercial/industrial and trespasser scenarios), but exceeds the USEPA risk management range for residential use.

Based on the risk evaluation of PAH concentrations in Tract 7 soils, UCC is not planning to perform any further sampling of Site soils, and no excavation of these soils for remediation purposes is necessary. In addition, because multiple lines of evidence indicate that the source of the PAHs in Tract 7 soils is not related to a spill or release of wastes or products from UCC activities, the PAHs are not subject to RCRA Corrective Actions. Furthermore, because the potential risk in Tract 7 is within the USEPA risk management range for non-residential use (i.e., commercial/industrial and trespasser scenarios), but exceeds the USEPA risk management range for residential use, UCC recommends that Tract 7 be restricted to non-residential uses.

Tables

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TABLE C-1
Benzo (a) pyrene Toxicity Equivalent Concentrations in Tract 7
Union Carbide Corporation
South Charleston, West Virginia

Sample Location	Sample Date	Sample Depth	Benzo (a) pyrene Equivalent* (µg/kg)
Screening Criteria - Residential RSL (1)			1,500 c
Screening Criteria - Trespasser RSL (2)			10,100 c
Screening Criteria - Industrial RSL (1)			21,000 c
SB-01	5/6/2002	2-4	**4,126**
SB-02	5/6/2002	4.5-6.5	243
SB-03	5/6/2002	0-1	231
SB-04	5/7/2002	6-8	254
SB-05	5/7/2002	5.5-7.5	557
SB-06	5/6/2002	2-4	529
SB-07	5/6/2002	2-4	341
SB-08	5/6/2002	2-4	231
SB-09	5/6/2002	2-4	220
SB-10	5/6/2002	2-4	231
SB-11	5/6/2002	6-7	1,156
SB-12	5/6/2002	2-4	231
SB-13	5/6/2002	2-4	1,156
SS-01	9/23/2010	1.5-2.5	64
SS-02	9/23/2010	0.5-1.5	**2,901**
SS-03	5/6/2011	0-1	3.1
SS-03	9/23/2010	1.5-2.5	***22,174***
SS-04	9/23/2010	1-2	14
SS-05	9/23/2010	0.5-1.5	81
SS-13	5/6/2011	0-1	3.1**
SS-13	5/6/2011	1.5-2.5	**16,718**
SS-14	5/6/2011	0-1	3.2
SS-14	5/6/2011	1.5-2.5	***24,654***
SS-15	5/6/2011	0-1	39
SS-15	5/6/2011	1.5-2.5	**3,423****
SS-16	5/6/2011	0-1	3.2
SS-16	5/6/2011	1.5-2.5	**13,278**
SS-17	5/6/2011	1.5-2.5	***22,284***
SS-18	5/6/2011	1.5-2.5	**20,277**
SS-20	5/6/2011	1.5-2.5	**3,675**
SS-03** Average			**9,733**

Notes:
RSL = Regional Screening Level c = Carcinogenic
µg/kg = micrograms per kilogram
Bold results exceed the residential screening level of 1,500 µg/kg.
Bold, underlined results exceed the trespasser screening level of 10,100 µg/kg.
Bold, underlined, italicized results exceed the industrial screening level of 21,000 µg/kg.
(1) Screening levels based on USEPA Regional Screening Levels (June 2011) and an excess lifetime cancer risk of 1×10^{-4}.
(2) Screening levels for a trespasser scenario are based on residential RSLs (as detailed in this table), and adjusted for an exposure frequency of 52 days/year.

* Benzo (a) pyrene equivalents calculated using Toxicity Equivalence Factors published in USEPA's Regional Screening Level User Guide (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm). Additionally, 1/2 the reporting limit was used for non-detect values.

** The average benzo (a) pyrene equivalent presented for SS-03 is the average of the September 2010 data from SS-03 and the May 2011 results from SS-03 and its surrounding step-out samples.

Table C-2
Risk Characterization Detail - Future Residential Exposure to Surface Soil at SS-03
Screening Level HHRA for the Area of Former Buildings 82 and 603
UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth, ft bgs	Chemical of Potential Concern	Sample Concentration	Units	Cancer RBSL	Cancer Risk	Contribution	Non-Cancer RBSL	Non-Cancer Hazard Quotient	% Contribution
SS-03	9/23/1910	1.5 - 2.5	Aroclor-1260	249	ug/kg	2.2E+02	1.1E-06	0.1	---	---	---
			Barium	598	mg/kg	---	---	---	1.5E+03	0.04	24.6
			Benzo (a) anthracene	16,700	ug/kg	1.5E+02	1.1E-04	7.4	---	---	---
			Benzo (a) pyrene	14,800	ug/kg	1.5E+01	9.9E-04	66.6	---	---	---
			Benzo (b) fluoranthene	14,000	ug/kg	1.5E+02	9.3E-05	6.3	---	---	---
			Benzo(k)fluoranthene	12,900	ug/kg	1.5E+03	8.6E-06	0.6	---	---	---
			Chrysene	16,000	ug/kg	1.5E+04	1.1E-06	0.1	---	---	---
			Dibenzo (a,h) anthracene	3,230	ug/kg	1.5E+01	2.2E-04	14.8	---	---	---
			Indeno (1,2,3-c,d) pyrene	9,290	ug/kg	1.5E+02	6.2E-05	4.2	---	---	---
			Mercury	0.683 J	mg/kg	---	---	---	1.0E+00	0.1	75.4
		SS-03 - Soil on 9/23/2010 Total Risk					**1.E-03**			**0.1**	

Notes:

ft bgs	feet below ground surface
mg/kg	milligrams kilogram
ug/kg	micrograms per kilogram
NA	not applicable
---	Toxicity data not available
J	Estimated result
RBSL	Risk-based screening levels are from the USEPA Regional Screening Level table for Industrial Air (June 2011) and based on a target risk of 1E-06 and a hazard quotient of 0.1.

TABLE C-3
Risk Characterization Detail - Future Trespasser Exposure to Surface Soil at SS-03
Screening Level HHRA for the Area of Former Buildings 82 and 603
UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth, ft bgs	Chemical of Potential Concern	Sample Concentration	Units	Cancer RBSL	Cancer Risk	Contribution	Non-Cancer RBSL	Non-Cancer Hazard Quotient	% Contribution
SS-03	9/23/1910	1.5 - 2.5	Aroclor-1260	249	ug/kg	1.5E+03	1.7E-07	0.1	---	---	---
			Barium	598	mg/kg	---	---	---	1.0E+04	<0.01	0.7
			Benzo (a) anthracene	16,700	ug/kg	1.0E+03	1.7E-05	7.5	---	---	---
			Benzo (a) pyrene	14,800	ug/kg	1.0E+02	1.5E-04	66.7	---	---	---
			Benzo (b) fluoranthene	14,000	ug/kg	1.0E+03	1.4E-05	6.3	---	---	---
			Benzo(k)fluoranthene	12,900	ug/kg	1.0E+04	1.3E-06	0.6	---	---	---
			Chrysene	16,000	ug/kg	1.0E+05	1.6E-07	0.1	---	---	---
			Dibenzo (a,h) anthracene	3,230	ug/kg	1.0E+02	3.2E-05	14.6	---	---	---
			Indeno (1,2,3-c,d) pyrene	9,290	ug/kg	1.0E+03	9.2E-06	4.2	---	---	---
			Mercury	0.683 J	mg/kg	---	---	---	6.7E+01	<0.01	99.3
		SS-03 - Soil on 9/23/2010 Total Risk					**2.E-04**			**<0.01**	

Notes:

ft bgs	feet below ground surface
mg/kg	milligrams kilogram
ug/kg	micrograms per kilogram
NA	not applicable
---	Toxicity data not available
J	Estimated result
RBSL	Risk-based screening levels are from the USEPA Regional Screening Level table for Industrial Air (June 2011) and based on a target risk of 1E-06 and a hazard quotient of 0.1.

Table C-4
Risk Characterization Detail - Future Industrial Exposure to Surface Soil at SS-03
Screening Level HHRA for the Area of Former Buildings 82 and 603

UCC South Charleston Facility, South Charleston, West Virginia

Location	Sample Date	Sample Depth, ft bgs	Chemical of Potential Concern	Sample Concentration	Units	Cancer RBSL	Cancer Risk	Contribution	Non-Cancer RBSL	Non-Cancer Hazard Quotient	% Contribution
SS-03	9/23/1910	1.5 - 2.5	Aroclor-1260	249	ug/kg	7.4E+02	3.4E-07	0.3	---	---	---
			Barium	598	mg/kg	---	---	---	1.9E+04	<0.01	16.5
			Benzo (a) anthracene	16,700	ug/kg	2.1E+03	8.0E-06	7.5	---	---	---
			Benzo (a) pyrene	14,800	ug/kg	2.1E+02	7.0E-05	66.5	---	---	---
			Benzo (b) fluoranthene	14,000	ug/kg	2.1E+03	6.7E-06	6.3	---	---	---
			Benzo(k)fluoranthene	12,900	ug/kg	2.1E+04	6.1E-07	0.6	---	---	---
			Chrysene	16,000	ug/kg	2.1E+05	7.6E-08	0.1	---	---	---
			Dibenzo (a,h) anthracene	3,230	ug/kg	2.1E+02	1.5E-05	14.5	---	---	---
			Indeno (1,2,3-c,d) pyrene	9,290	ug/kg	2.1E+03	4.4E-06	4.2	---	---	---
			Mercury	0.683 J	mg/kg	---	---	---	4.3E+00	0.02	83.5
		SS-03 - Soil on 9/23/2010 Total Risk					**1.E-04**			**0.02**	

Notes:

ft bgs	feet below ground surface
mg/kg	milligrams kilogram
ug/kg	micrograms per kilogram
NA	not applicable
---	Toxicity data not available
J	Estimated result
RBSL	Risk-based screening levels are from the USEPA Regional Screening Level table for Industrial Air (June 2011) and based on a target risk of 1E-06 and a hazard quotient of 0.1.

TABLE C-5
Carcinogenic Risk Estimates For Polynuclear Aromatic Hydrocarbon Concentrations in Tract 7 Soils
Union Carbide Corporation
South Charleston, West Virginia

Tract 7 Benzo (a) pyrene Equivalent EPC (µg/kg)	Screening Criteria - Residential RSL (1) (µg/kg)	Screening Criteria - Trespasser RSL (2) (µg/kg)	Screening Criteria - Industrial RSL (1) (µg/kg)	Residential Carcinogenic Risk Estimate	Trespasser Carcinogenic Risk Estimate	Industrial Carcinogenic Risk Estimate
2,586	15 c	101 c	210 c	**2.E-04**	3.E-05	1.E-05

Notes:
EPC = exposure point concentration
RSL = Regional Screening Level c = Carcinogenic
µg/kg = micrograms per kilogram
Bold carcinogenic risk estimates are greater than $1x10^{-4}$.
(1) Screening levels based on USEPA Regional Screening Levels (June 2011) and an excess lifetime cancer risk of $1x10^{-6}$.
(2) Screening levels for a trespasser scenario are based on residential RSLs (as detailed in this table), and adjusted for an exposure frequency of 52 days/year.

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Figure

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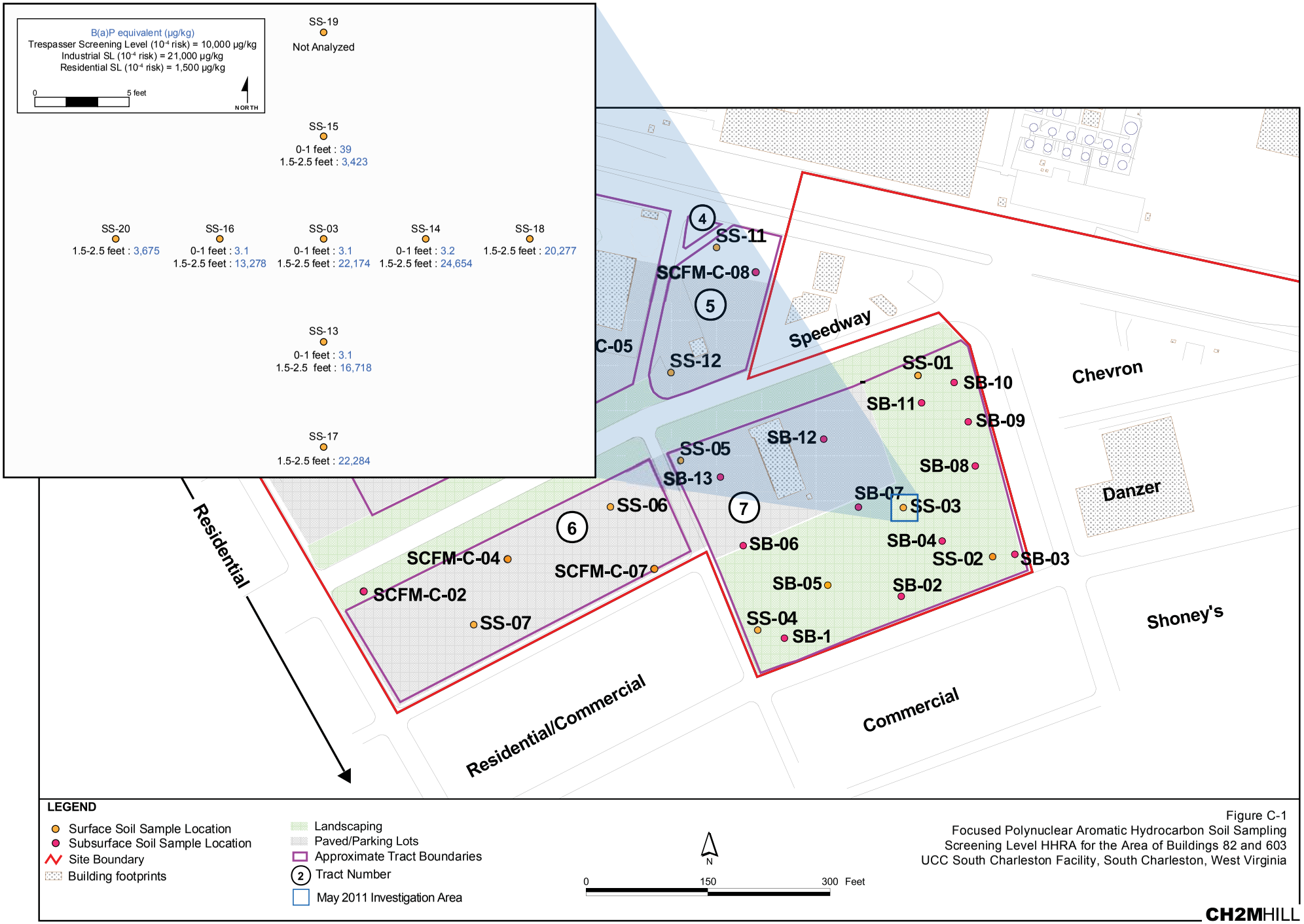

Figure C-1
Focused Polynuclear Aromatic Hydrocarbon Soil Sampling
Screening Level HHRA for the Area of Buildings 82 and 603
UCC South Charleston Facility, South Charleston, West Virginia

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Appendix D

ProUCL Input and Output Worksheets (provided electronically on CD)

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